Prepared for:

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Navy Public Works Center
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Field Work Plan for RCRA Corrective Action of SWMU Sites 13, 16, 40 and Various Septic Tanks at **Naval Weapons Station Concord**

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1. Project Description

1.1 Introduction

CH2M HILL has a delivery contract, N68378-94-D-5885, D/O 0003, with the Navy Public Works Center San Francisco Bay (PWCSFB) to provide various environmental services for Resource Conservation Recovery Act (RCRA) Corrective Action for the mitigation of three Solid Waste Management Units (SWMU):13, 16 and 40 at the Naval Weapons Station Concord (NWSC). The scope of work also includes various environmental services for eight septic tank areas at SWMU Sites 12, 14, 17, 20, 23, 24, 44, and 54 at the base. Figure 1.1 depicts these project locations.

SWMU Site 13 is a septic tank near Building IA-25; the contents of the tank were analyzed and RCRA wastes were detected. The Navy proposed to remove existing tank contents; to transport, treat and dispose of waste offsite at a permitted and authorized hazardous waste disposal facility, and to pressure wash the inside of the tank.

SWMU Site 16, a former pesticide mixing and storage building, is currently a partially paved area. A previous site investigation detected pesticides contamination, primarily DDT, at the first 6 inches of topsoil at three of the boring locations. The Navy proposed to excavate the DDT-contaminated soil at this area, restore the excavated area, and provide offsite treatment and disposal of the excavated materials.

SWMU Site 40 is a small gravel-covered area adjacent to an electric substation, Building 174. The topsoil collected from a boring location adjacent to the south entrance of the building was detected with low PCB concentrations. The Navy proposed to excavate and remove the contaminated topsoil at an 8-square-foot impacted area, to restore and cap the excavated area with a concrete pad, and to provide offsite treatment and disposal of the excavated soil.

The nine septic tanks located at SWMU Sites 12, 14, 17, 20, 23, 24, 44, and 54 (SWMU 54 has two septic tanks) have never been cleaned since their installation; most septic tanks were installed in the mid- and late-1940s. Recent preliminary sampling results indicate that the contents of the tanks are nonhazardous; however, some of the wastewater and pumpable sludge contained in the tanks may not meet the permit requirements to allow the waste to be discharged to the Central Contra Costa Sanitary District (CCCSD) facility. The Navy plans to remove the contents of these tank, treat the waste if necessary, transport and dispose of the waste to permitted and authorized waste disposal facilities. All of the septic tanks will be pressure-washed after the tank contents are removed.

This report constitutes the Field Work Plan. In it, we describe the site-specific field activities planned for the RCRA Corrective Actions at SWMU Sites 13, 16 and 40, and the removal of septic tank contents and other associated services for the nine septic tanks at the other eight SWMU sites. The site-specific field activities will include a soil sampling program for SWMU 16 and 40 to verify that all contaminated soils were removed and to characterize the excavated materials to meet the disposal requirements. Engineering specifications are

included in the Field Work Plan to describe restoration of ground surfaces at SWMU Sites 16 and 40. A wastewater and sludge sampling program will be presented to characterize the waste disposal requirements of the contents for the 10 septic tanks.

The Field Work Plan has been prepared to comply with the site closure requirements and guidelines presented in the RCRA Corrective Action Work Plan for SWMU Sites 13, 16 and 40 at NWSC prepared by Naval Facilities Engineering Command Engineering Field Activities West (EFA West, 1996). The EFA West 1996 Work Plan has been approved by the Department of Toxic Substances Control (DTSC), Regional Water Quality Control Board (RWQCB), and Environmental Protection Agency (EPA).

The Field Work Plan contains the following sections:

Section 1 — Project Description: Provides an introduction, project overview, field work plan objectives, and project background.

Section 2 — Sampling and Analysis Plan: Describes sampling and analytical procedures, including the quality control procedures and measures, implemented to characterize wastewater and sludge from the 10 septic tanks and soils from SWMU Sites 16 and 40 to determine proper disposal requirements and alternatives.

Section 3 — Health and Safety Plan: Presents the plan prepared specifically for the field sampling and site restoration work to meet the requirements of 29 CFR 1910.120 and other applicable regulatory requirements.

Section 4 — Environmental Protection and Waste Management Plan: Describes the measures and permit requirements applied to protect the natural resources, and the provisions taken to handle, store, and dispose of wastes generated during construction and site restoration.

Section 5 — Construction Specifications: Provides construction specifications for site controls, excavation, fill and backfill, concrete work, and asphalt concrete pavement work.

Section 6 — Schedule: Presents an overall schedule for conducting all field activities and the preparation of the Summary Report.

Section 7 — References.

Appendices

1.2 Objectives

There are five primary objectives of the overall project.

1) Implement the corrective actions approved by the DTSC, RWQCB, and EPA for SWMU 13, 16, and 40.

2) Conduct wastewater and sludge sampling at the septic tank of SWMU 13 to comply with hazardous waste disposal requirements. Conduct soil sampling to verify that all contaminated soils at SWMU 16 are removed and to comply with waste disposal

requirements for the contaminated soils. For SWMU 40, excavate contaminated soil at a designated 8-square-foot impacted area and cap the area with a concrete pad.

3) Conduct a wastewater and sludge sampling program for the nine septic tanks at SWMU Sites 12, 14, 17, 20, 23, 24, 44 and 54 to determine the waste disposal alternatives and requirements for contents removed from these tanks.

4) Properly store, handle, and dispose of waste generated for this project. Also provide waste treatment offsite if necessary.

5) Obtain agencies' approval for "no further actions required" for SWMU 13, 16, and 40.

This Field Work Plan has been prepared to meet the following two objectives:

- Organize a plan for use by PWCSFB, CH2M HILL, and CH2M HILL's contract laboratory in conducting field sampling, construction and site restoration work for various SWMU sites indicated.

- Present the project team with the steps that they must take to achieve a successful field sampling, construction and site restoration work at NWSC.

1.3 Background

The Concord Naval Weapons Station (Station) is a naval munitions transshipment facility whose primary purpose is to handle, ship, maintain, overhaul, and service munitions. It is located in Concord, California, within Contra Costa County, 30 miles northeast of San Francisco, and occupies 13,000 acres. It consists of the Tidal Area and the Inland Area. (The radiography facility is also part of the Station but is located in Pittsburg, California.) The Station is bounded by the Suisun Bay to the north and the city of Concord to the south and west.

After a remedial investigation was conducted in 1995, the base has identified three areas that were found to need mitigation under RCRA: SWMU 13, 16. and 40. This mitigation is outlined in detail in the "Corrective Action Work Plan for Solid Waste Management Units 13, 16, and 40" (EPA West, 1996).

The past operations within the building associated with the septic tank at SWMU 13 included pilot-scale development of munitions, including explosives. This building also housed a paint booth. The building has been renovated to be a production facility for the rework of explosives. Under the remedial investigation, the media of concern were sampled and analyzed to determine the extent of contamination. The sampling results indicated that while there have been no significant releases of hazardous constituents to the surrounding environment from the septic tank located at SWMU 13, hazardous constituents have been detected in the water and sludge of the septic tank. Volatile organic compounds, semivolatile organic compounds, and metals exceeded the RCRA hazardous waste criteria. 1,1,1-TCA, TCE, chromium, and lead have been found in elevated concentrations. The corrective action for SWMU 13 requires the removal and proper disposal of the hazardous waste emptied from the septic tank.

SWMU 16 is a former pesticide mixing and storage building area. Previous sampling results indicate that DDT was found from the topsoils. The corrective action for SWMU 16 requires the removal of the contaminated soil, treat excavated soils if necessary, and dispose of the soil. The impacted area will be backfill with clean soil, and the ground cover restored with asphalt pavement.

At SWMU 40, the associated building used to house operational and non-operational PCB transformers. The building currently houses operational non-PCB transformers. The remedial investigation indicated that PCBs were found in the surface soil from one of the boring location and it could be caused by an isolated surface spill located just outside of the service door in the transformer building. The corrective action requires to pave over an excavated the area (8 feet x 8 feet, 1.5 feet excavation depth) of concern.

As part of this workplan, but not part of the Corrective Action Plan, the base also plans to remove the contents of nine other septic tanks location at eight SWMU sites: 12, 14, 17, 20, 23, 24, 44, and 54. The contents will then be treated if necessary and disposed of, and the interior of the tanks will be cleaned. Past and current operations of the buildings associated with these eight SWMU sites are included in Table 1.1.

Table 1.1
Building Uses Associated with Septic Tanks
Naval Weapons Station, Concord

SWMU	Building	Past Building Use	Current Building Use
12[a]	IA-24	Houses forklift equipment and its maintenance operations including steam cleaning, which generated some hazardous wastes.	Houses forklift equipment and its maintenance operations which generates some hazardous wastes.
13	IA-25	Was used exclusively for pilot-scale development of munitions testing, including explosives. Housed a paint booth.	Renovated to be a production facility for the rework of explosives.
14	IA-27	Housed carpenter shop where paints and thinners were used.	Serves as a storage facility for the Marines' furniture housed on base, and miscellaneous office materials.
16	IA-46	Stored paint, oxygen, acetylene, asbestos, and miscellaneous materials used to repair and maintain facilities.	Houses a light bulb crusher and the same as past use.
17	IA-50	Used as a transfer station for ordnance materials.	Same as past use.
20[a]	IA-55	Same as current.	Office building where tools and supplies are issued and returned, and lunch room.
23	87	Was a minor maintenance facility (e.g., labeling of ordnance using stencil and spray cans, and missile testing facility).	Maintenance for various ordnance items, such as inspection, segregation, cleaning and repackaging.
24	93	During normal operations it generated hazardous waste, e.g., paint cans, solvent, adhesives. Also missile testing facility.	Various inert and ordnance workload: inspection and testing slings and other ordnance handling apparatus.
40	174	Housed electric substation with electrical PCB transformer. Stored PCB transformers not in use.	Houses electric substation with electrical non-PCB transformer.
44[b]	350/351	Inside known as the Q Area. Building 351 housed the Marine Corps, who used to guard it. Building 350 was ordnance maintenance building. During normal operations, Building 350 generated hazardous waste (e.g., paint cans, solvent, adhesives).	Building 350 is a satellite accumulation points for hazardous wastes, also for ordnance maintenance. Building 351 is presently vacant.
54	79	Housed the Reaction Fast Force of Marines who patrolled the Alpha High security area.	Unused.

[a] Only one septic tank is located at SWMU 12 and 44. This tank serves both buildings IA-24 and IA-55.

[b] Septic tank serves both buildings 350 and 351.

2. Sampling and Quality Control Plan

2.1 Septic Tank Sampling

The contents of the septic tanks associated with the buildings at SWMU sites 12, 13, 14, 17, 20, 23, 24, 44 and 54 will be sampled and analyzed before they are removed, the tanks will then be cleaned. The sampling objective is to characterize the wastewater and non-pumpable sludge accumulated in each of the tanks to determine proper disposal requirements and alternatives. Depending on the characteristics of the wastewater and sludge, three disposal facilities will be considered: CCCSD facility, a domestic waste disposal facility, or a hazardous waste disposal facility, as determined by the Navy's Public Works Center.

2.1.1 Septic Tank Conditions

Construction drawings are available for some of the septic tanks located at the NWSC. These drawings indicate that the septic tanks were installed in the mid- and late-1940s, with the exception of those in SWMU 23 and 24, both of which were installed in the late 1950s, and the tank in SWMU 54, which was replaced in 1979 .The septic systems were designed to collect and treat domestic waste. Table 1.1 summarizes the historical and current uses for the building associated with each of the septic systems.

The typical septic tank is a rectangular, concrete container consisting of two chambers with a total storage capacity of 2,000 to 3,000 gallons. In the inlet chamber (receiving chamber) the solids accumulate and become sludge. This inlet chamber is approximately 2/3 of the total septic tank volume. The wastewater accumulates in the outlet chamber and is discharged into the drain field. This outlet chamber is approximately 1/3 of the total septic tank volume. The typical maximum wastewater depth of each tank is designed to be about 4 to 5.5 feet before wastewater discharges into the drainfield. The typical sludge thickness in the two chambers is expected to be 2 feet or more. The NWSC facility staff indicate that these tanks have never been cleaned and, therefore, the sludge accumulated in the chamber is potentially greater than 2 feet thick.

Each tank has two manhole covers: one above the inlet chamber and one above the outlet chamber. According to the construction drawings, the manhole openings are either square (2 feet by 2 feet), or circular (2 feet in diameter). A typical cross section of the septic tank is shown in Figure 2.1.

In 1995, the contents of each of the 10 tanks (SWMU 54 has two tanks) were sampled and analyzed. The contents of the tanks were then classified as either nonhazardous or hazardous according to RCRA classification, and that the constituents found exceeded or did not exceed those requirements stipulated by the CCCSD. Only the contents of one tank, in SWMU 54 (SP01), were classified as nonhazardous and did not exceed the CCCSD requirements. Eight of the tanks in the following SWMUs have contents that were considered nonhazardous, but exceed the CCCSD requirements: 12, 14, 17, 20, 23, 24, 44,

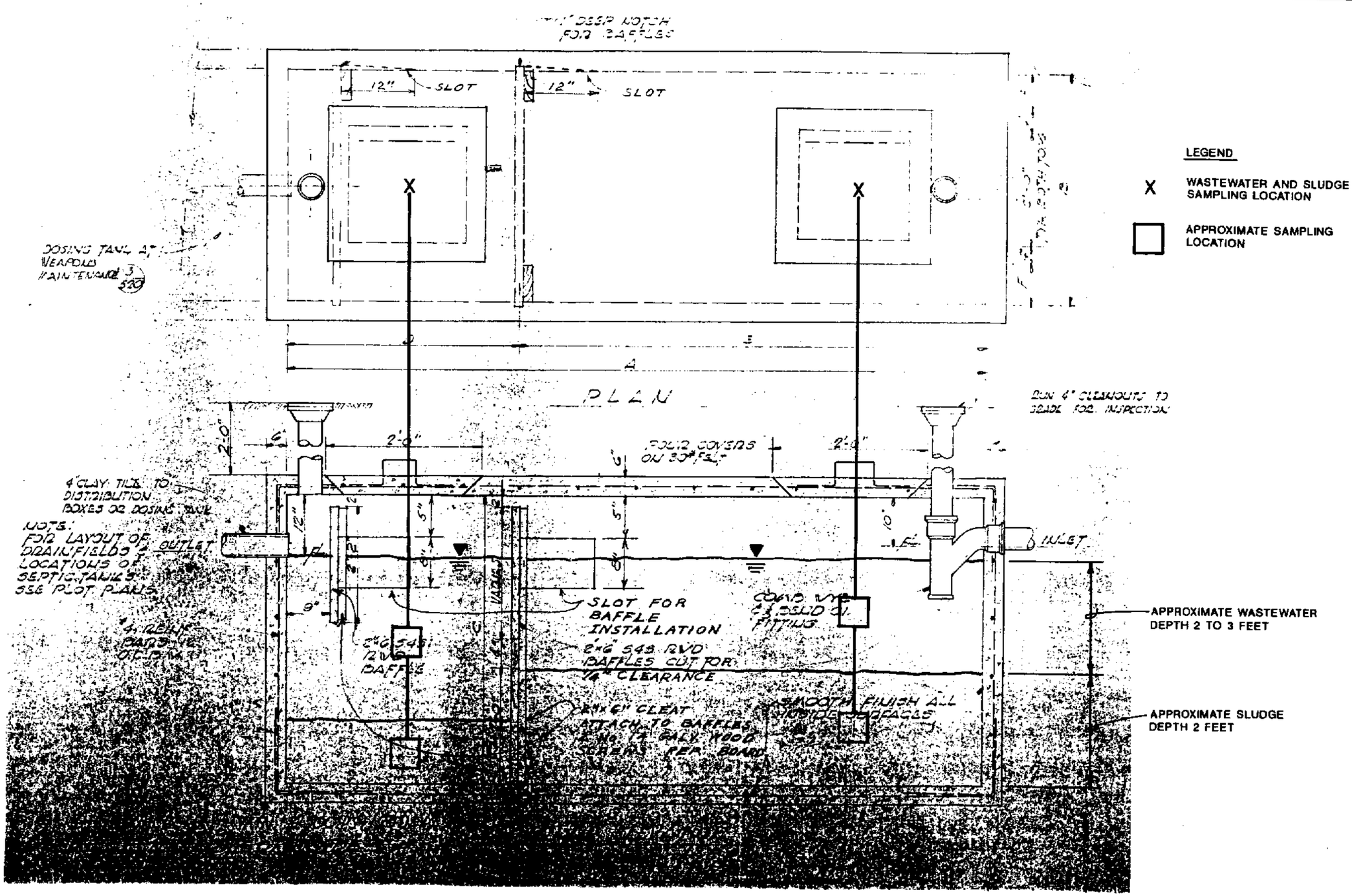

FIGURE 2-1
TYPICAL SEPTIC TANK CROSS SECTION AND SAMPLING LOCATION

and 54 (SP02). Only one of the tanks, in SWMU 13, had contents that were considered RCRA hazardous and exceeded the CCCSD requirements.

2.1.2 Sampling Requirements

The wastewater that has accumulated in the septic tanks will be sampled and analyzed according to the Special Permit requirements established by the CCCSD. The number of samples that will be collected depends on the analytical requirements of the constituents of concern. Table 2.1 summarizes the sampling requirements at each of the septic tanks, including constituents of concern to be analyzed, sampling location, sampling equipment, sample volume, type of sampling container, preservative requirements, and analysis to be performed. Samples will be collected at each of the locations shown in Figures 2.1, composited, and submitted to the laboratory as representative samples. The procedures of collecting samples from each tank are discussed in detail in Subsection 2.1.4.

2.1.3 Sampling Equipment

Since most of the septic tanks have been in operation for more than 40 years and the contents of the tanks are not fully known, the contents of the tanks most likely constitute wastewater, liquid sludge that will pour easily (pourable or pumpable sludge), and liquid sludge that will behave like a thick slurry and is difficult to pour (non-pourable sludge). The samples collected from each tank will include one sample of wastewater with some pourable sludge and one sample of non-pourable sludge (accumulated at the bottom of the tank) with some pourable sludge.

The sampling equipment will depend on the wastewater or sludge levels and the consistency (relative percent solids) of the strata, as observed in the field. A Teflon dipper, bailer, or liquid bomb sampler can be used to collect wastewater. A Teflon dipper or a clamshell sampler can be used to collect non-pourable sludge.

The following paragraphs describe the sampling devices in detail and appropriate methods of usage.

Teflon Dipper

The Teflon dipper is made of a long rod connected to a 250-ml or 1-liter bailer. This sampler is ideal for wastewater or soil materials which are accumulated in only about one or two feet in depth. The bailer is lowered to the approximate location of the desired sample, and the material is scooped. Wastewater only can be collected above the solid phase. The solid material can be obtained by decanting the unwanted wastewater from the surface of the sample, if necessary.

Bailers

Bailers are long, thin, disposable PVC tubes manufactured in variable sizes. They are used to collect wastewater samples from deeper wastewater with low solids content. For this project, 2- to 3-feet long bailers, 2 to 3 inches in diameter, are preferred, given the relatively shallow depth of the tanks. The bailer, attached to a weight, is lowered to the desirable depth—the approximate midsection of the wastewater stratum of the sample—to collect the water. Once the bailer is filled with wastewater, the bailer cord is pulled, capping the bottom of the bailer to prevent the sample from exiting.

Table 2.1
Sampling and Analysis
Naval Weapons Station, Concord

Constituents	Acronym	Location	Medium	Sampling Group*	Sample Volume	Container	Sample Preservation	Laboratory Method	Reporting Limit	Units	Holding Time (days)
Field Methods											
Temperature	T	All septic tanks	Wastewater, Sludge	A	500 mL	Plastic beaker	NA	E170.1	0.1	°F	Immediate
pH	pH							SW9040	0.1	none	Immediate
Electrical Conductivity	EC							SW9050	1	µmhos/cm	Immediate
Total Dissolved Solids	TDS							E160.1	3	mg/L	Immediate
Dissolved Oxygen	DO							EPA 360.1	0.1	mg/L	Immediate
DDT	DDT	SWMU 16	Soil	B	500 ml	Glass beaker	NA	SW4042	0.2	mg/Kg	Immediate
Polychlorinated Biphenyls	PCBs	SWMU 40					NA	SW4020	1	mg/Kg	Immediate
Laboratory Methods											
DDT	DDT	SWMU 16	Soil	C	4 oz	8oz, glass, jar	4°C	SW8080 (MOD)	7.4	µg/Kg	7
Poly Chlorinated Biphenyls	PCB	SWMU 40						SW8080 (MOD)	(a)	µg/Kg	7
Antimony	Sb	All septic tanks	Wastewater, Sludge	D	1 L	Polyurethane	4°C, pH<2 (HNO_3)	EPA- CLP SOW	60	µg/L	180
Arsenic	As								10	µg/L	180
Cadmium	Cd								5	µg/L	180
Chromium (total)	Cr								10	µg/L	180
Copper	Cu								25	µg/L	180
Lead	Pb								3	µg/L	180
Mercury	Hg								0.2	µg/L	28
Nickel	Ni								40	µg/L	180
Selenium	Se								5	µg/L	180
Silver	Ag								10	µg/L	180
Thallium	Tl								10	µg/L	180
Zinc	Zn								20	µg/L	180
Cyanide	CN	All septic tanks	Wastewater, Sludge	E	1 L	Polyurethane	4°C, pH>12 (NaOH)	EPA- CLP SOW	10	µg/L	14
Phenolic Compounds		All septic tanks	Wastewater, Sludge	F	2.5 L	Amber glass bottle	4°C	EPA 625	50	µg/L	7
pH	pH			K	1 L	Polyurethane	4°C	SW9040	0.1	none	Immediate
Oil and Grease		All septic tanks	Wastewater, Sludge	G or H	1 L	Glass jar	4°C, pH<2 (H_2SO_4)	SM5520B	5	mg/L	28
Mineral (Hydrocarbons)				G	1 L	Glass jar	4°C, pH<2 (H_2SO_4)	SM5520F	5	mg/L	28
Animal and Vegetable (Fatty Acids)				H	1 L	Glass jar	4°C, pH<2 (H_2SO_4)	SM5520B-5520F	5	mg/L	28
Total Toxic Organics	TTO	All septic tanks	Wastewater, Sludge	I	3, 40 mL	Glass (VOAs)	4°C, pH<2 (HCl)	EPA 624*	(a)	mg/L	7
Total Toxic Organics	TTO	All septic tanks	Wastewater, Sludge	F	2.5 L	Amber glass bottle	4°C	EPA 625*	(a)	mg/L	7
Chlorinated Pesticides		All septic tanks	Wastewater, Sludge	J	2.5 L	Amber glass bottle	4°C	EPA 608*	(a)	mg/L	7
Polychlorinated Biphenyls	PCBs							EPA 608*	(a)	mg/L	7
Biochemical Oxygen Demand	BOD	All septic tanks	Wastewater, Sludge	K	1 L	Polyurethane	4°C	EPA 405.1	3	mg/L	2
Total Suspended Solids	TSS				1 L	Polyurethane	4°C	EPA 160.2	3	mg/L	7
Chemical Oxygen Demand	COD	All septic tanks	Wastewater, Sludge	L	250 mL	Polyurethane	4°C, pH<2 (H_2SO_4)	EPA 410.4	7	mg/L	28

(a) See Attached Table C in Appendix A.

* Method requested by the Central Contra Costa Water District

**Each sampling group letter represents a different container for the analyses listed.

Liquid Bomb Sampler

Discrete wastewater and pourable sludge samples can be collected using the liquid bomb sampler. This sampler is ideal for collecting samples from accumulations that are deeper than 2 feet thick. This sampler, which consists of a hollow 2- to 3-inch-diameter, open-ended tube, is 18 inches long. In order to collect a wastewater sample, the tube (with an attached cable with a trigger) is gently submersed (so as to not disturb the equilibrium) into the wastewater to the approximate midsection of the stratum. When the trigger is released, the end-caps collapse, tightly capturing the liquid sample within the tube.

Ponar (Clamshell) Dredge Sampler

Discrete sludge samples can be collected using a Ponar Dredge Sampler (clamshell sampler). The clamshell sampler is ideal for collecting relatively solid material, and can collect samples from accumulations of any depth. It is a 6-inch-cubed stainless steel container. In order to collect the nonpourable sludge, the sampler is released from a cable into the sludge layer. Once in place, the trigger is released, which closes the set of jaws on the bottom of the box and captures the relatively solid material. By the time the sampler is lifted to the surface, the sample is de-watered, and a discrete nonpourable sample of sludge is obtained.

2.1.4 Sampling Procedures

One composite representative sample will be collected from each of the septic tanks from the two expected strata: wastewater and nonpourable sludge. In order to successfully collect samples, following steps will be followed:

- Determine the levels, consistency, and volume of the strata of tank contents
- Determine appropriate sampling equipment
- Sample the wastewater
- Sample the nonpourable sludge
- Label and package the samples collected
- Decontaminate or dispose of the sampling equipment
- Ship the samples to the laboratory

These steps are further detailed below.

Step 1: Determine the Levels, Consistency, and Volumes of the Wastewater and Sludge Strata

In order to determine the level of the wastewater and sludge, a stick wrapped with rough, white toweling (or a wooden stick or PVC rod) will be lowered vertically into the contents of the tank until it touches the bottom of the tank. It will be kept in that position for several minutes. After the stick is raised, the sludge layer can be distinguished by sludge particles clinging to the toweling or to the stick. This will be performed at both manhole opening (above inlet and outlet chambers) at each tank, as shown in Figure 2.1.

The depths, consistency, and calculated volumes of each strata (wastewater and sludge) will be measured in each tank and will be recorded in the field log book. The techniques for measuring sludge and wastewater levels in a septic are adopted from the EPA Design Manual, Onsite Wastewater Treatment and Disposal Systems - Septic Tank, Operation, and Maintenance (EPA, 1980).

Step 2: Determine Sampling Equipment

The selection of sampling equipment will be determined on a trial-and-error basis, depending on the existing conditions of the contents of the tank. After completing the sampling of approximately the first two tanks, the individual conducting the sampling will be able to select the best equipment for sampling the rest of the tanks.

Step 3: Collect a Composite Wastewater Sample

In order to collect a composite wastewater sample, two samples will be grabbed from the manhole openings as shown in Figure 2.1. One grab sample will be collected from each of the two chambers of the tank to make one composite sample: one grab sample from the inlet chamber will represent 2/3 of the composite sample, one grab sample from the outlet chamber will represent 1/3 of the composite volume sample (ratios are proportional to the ratios of the chamber volumes of the septic tanks).

The contents of the grab sample from the inlet chamber will be poured into the sample container until it is 2/3 full. The contents of the grab sample from the outlet chamber will be poured into the same sample container such that the remaining 1/3 is filled.

The samples will then be labeled and documented according to Step 5.

Step 4: Collect Nonpourable Composite Sludge Sample

A disposable plastic tarp will be laid out where the sample containers will be placed and filled.

In order to collect a composite, nonpourable sludge sample, two samples will be grabbed from the two manhole openings as shown in Figure 2.1. One nonpourable grab sludge sample will be collected from the two locations to make one composite sample: the grab sample from the inlet chamber will represent 2/3 of the composite sample volume, the grab sample from the outlet chamber will represent 1/3 of the composite sample volume.

The grab sample from the inlet chamber will be scooped out with a small hand shovel such that 2/3 of the total volume per sample container is filled. The grab sample from the outlet chamber will be scooped out and poured into the remaining 1/3 of the sample container.

The samples will then be labeled and documented according to Step 5.

Step 5: Labeling and Packaging

After successfully sampling the contents of the septic tanks, the labels and seals will be filled out as prescribed in Section 2.4.4 Sample Numbering System and the chain-of-custody form will be completed following the procedures outlined in Section 2.4.5 Sample Custody and Documentation.

The samples will be placed in a cooler with ice. The chain-of-custody document will be filled out and placed within each cooler. A Trip Blank sample will be placed in each cooler, or at a minimum as prescribed in Table 2.1, whichever yields the greatest number. The cooler will remain in the personnel custody until the samples are ready for shipment.

Step 6: Dispose or Decontaminate Sampling Equipment

After sampling and documenting the samples, the sampling equipment will be decontaminated as prescribed in Section 2.4.6 Decontamination or disposed as prescribed in Section 4.2 Waste Management Plan.

Step 7: Shipment

All collected samples will be shipped to Quality Analytical Laboratories (QAL) in Redding via Federal Express with priority overnight mail delivery.

2.2 SWMU Site 16 Sampling

The surface soil of a former pesticide mixing and storage building site (SWMU Site 16) just west of Building IA-16 was contaminated with pesticides; the primary constituent of concern is DDT (Figure 2.2). The contaminated soil of the impacted area will be excavated, removed, and the excavated area will then be backfilled with clean soil. During excavation, soil samples will be collected from the base of the excavation and analyzed to confirm that all contaminated soils were removed from the site. After all contaminated soils are excavated and stockpiled, soil samples will be collected from the stockpile and analyzed to meet disposal requirements. The following describes the sampling requirements, approach, and procedures for conducting sampling work at SWMU Site 16.

2.2.1 Site Conditions

Previous soil sampling was conducted at SWMU Site 16 in March 1995 and October 1995. The sampling results indicated that pesticides were present only at the first 0.5 foot of top soil at borings 16-04, 16-05, and 16-06.

2.2.2 Sampling Requirements and Procedures

Confirmation Sampling to Remove Contaminated Soils

Based on the previous site investigation and soil sampling results, a preliminary soil excavation layout (Figure 2.2) was developed for use in removing the DDT-contaminated soils. A 10-foot grid system, using the western border of Building IA-16 as reference point, was established to provide a systematic approach for the soil excavation and sampling work for the site.

After the area is excavated to the initial desired depths as shown in Figure 2.2, soil samples will be collected at the base of the excavation and analyzed for DDT using field test kits. The locations of the initial round of sampling to be analyzed using field test kits are shown in Figure 2.2. The field test kit has a detection limit of 0.2 mg/kg for DDT. A CH2M HILL chemist will be present in the field to certify that the sampling staff has properly used the field test kits. If the field test results indicate that the soil sampled from the base of the excavation has a detectable level of greater than or equal to the DDT cleanup criterion of 1 mg/kg, further excavation will continue in that area to increase the excavation depth by 6 inches to 1 foot and/or lateral extent, as applicable. The area where the excavation extended will continue to be sampled/excavated until the analytical results are below the DDT cleanup action level of 1 mg/kg.

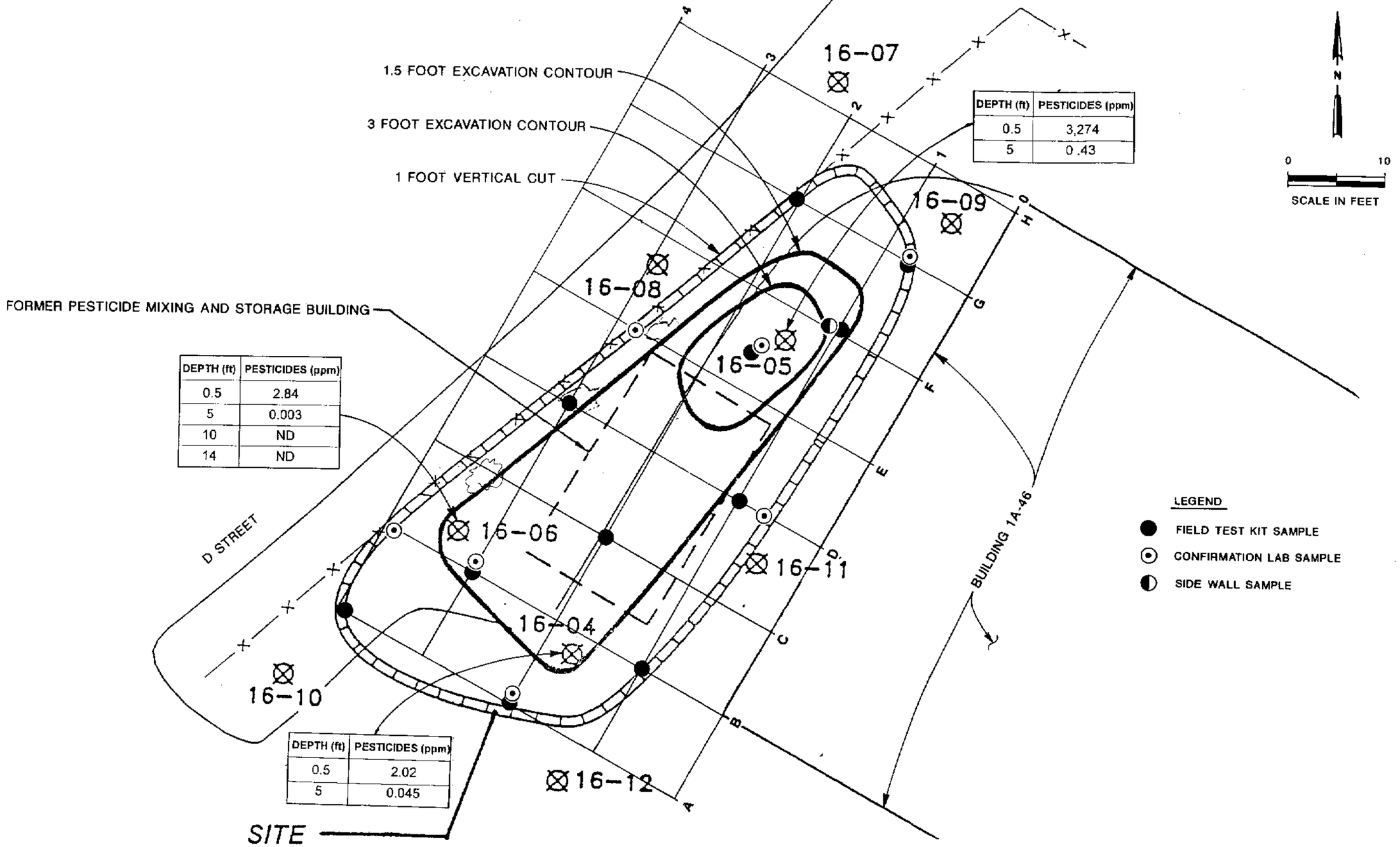

FIGURE 2-2
SOIL SAMPLING GRID LAYOUT FOR SWMU 16

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After an initial screening of contaminated soils using the field testing kits is complete, a final confirmation sampling will be collected and submitted to QAL, an offsite analytical laboratory. The confirmation samples will be collected at the base of excavation (locations are shown in Figure 2.2). These locations were selected to meet the sampling requirements indicated in the RCRA Corrective Action Workplan (EFA West, 1996); samples are to be collected 25 feet on center at the base of the excavation, 25 feet on center at the perimeter of the base, and one sample from the excavation pit sidewall.

A flowchart, Figure 2.3, depicts the soil sampling procedures described above.

Sampling of Excavated Soil for Disposal

Ground surface at SWMU Site 16 is asphalt concrete. The excavated asphalt concrete will be stockpiled separately from the excavated soil from this site. One sample of the excavated asphalt material will be sent for pesticides analysis. If the asphalt material tested is determined to be nonhazardous, it will be transported to a recycling facility when feasible. The final list of constituents of concern for the asphalt stockpile sample will be determined by Laidlaw Environmental Services in accordance with the disposal facility requirements.

Each hazardous waste disposal facility has its own sampling requirements for accepting waste. As a general rule of thumb, one sample should be collected from at least every 500 cubic yards of soil or per truck load. The estimated total volume of soil to be excavated from SWMU Site 16 is less than 200 cubic yards; therefore, one composite sample (from the four corners of the stockpile) will be collected from the stockpile at this time. The composite soil sample will be tested for pesticides and CAM metals; and the final list of constituents of concern for the stockpile sample will be determined by Laidlaw Environmental Services.

2.3 SWMU Site 40 Sampling

In 1995, a site investigation performed by PRC Environmental Management at SWMU Site 40 indicated that one of the sampling locations (Boring 40-3) at the south entrance of Building 174 was detected with PCBs at a concentration of 0.59 mg/kg at the surface soil. A remediation plan for the removal of PCB contaminated soil at the Boring 40-3 location was approved by the regulatory agencies in approximately April 1996 (EFA West, 1996). The remediation plan requires an excavation area of 8 feet by 8 feet and excavation depth of 1.5 feet (Figure 2.4) and requires the area of concern to be paved over. Verification sampling of soil will be performed prior to backfilling with clean soil, compacting, and paving with a concrete pad.

After the soil is excavated to 1.5 feet from the existing ground surface for the 8-square-foot area, a soil sample and a duplicate sample will be collected from the base of the excavation and shipped to QAL for PCB analysis. A soil sample will also be collected from the excavation material and be tested to meet disposal requirements. The analysis results will be documented in the summary report.

2.4 Quality Assurance and Quality Control Plan

The quality assurance and quality control (QA/QC) plan consists of two major aspects: field QA/QC and laboratory QA/QC. Field sampling QA/QC includes properly

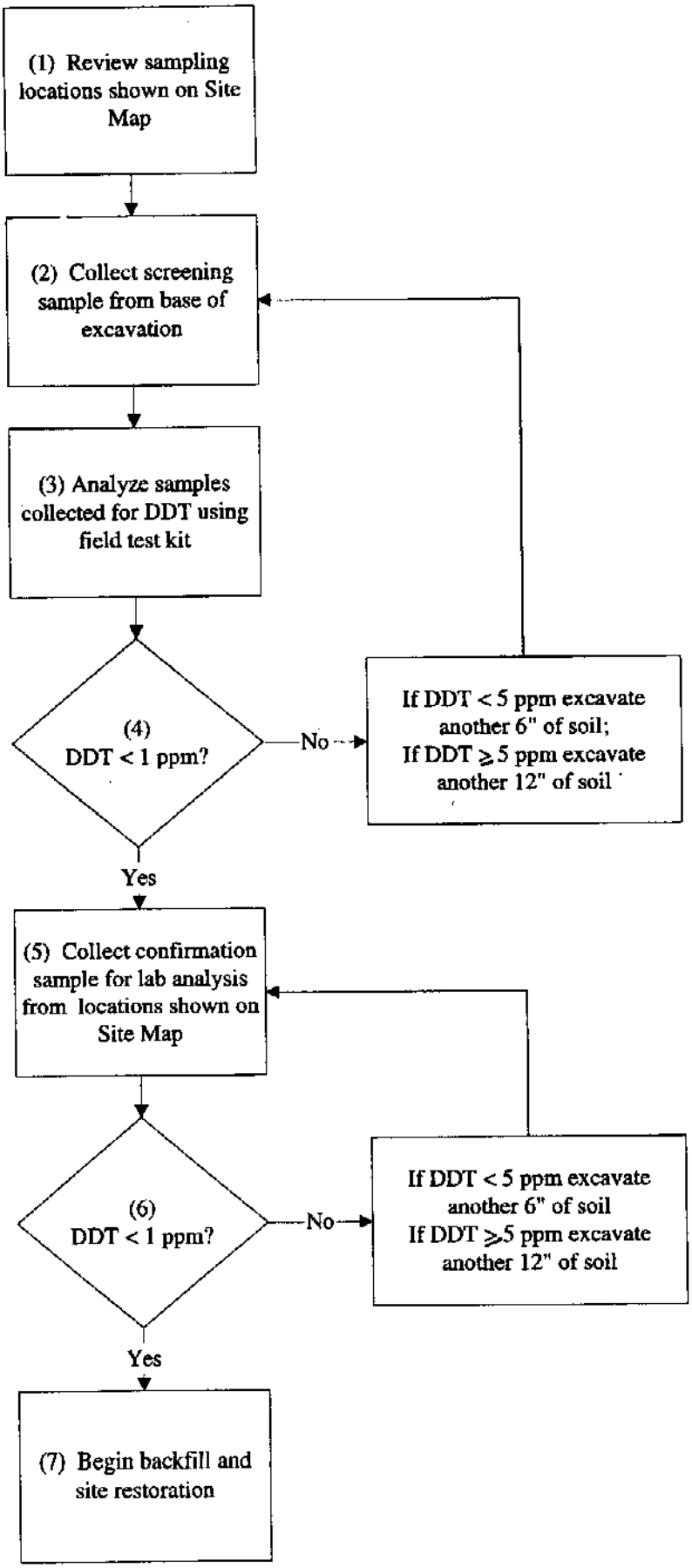
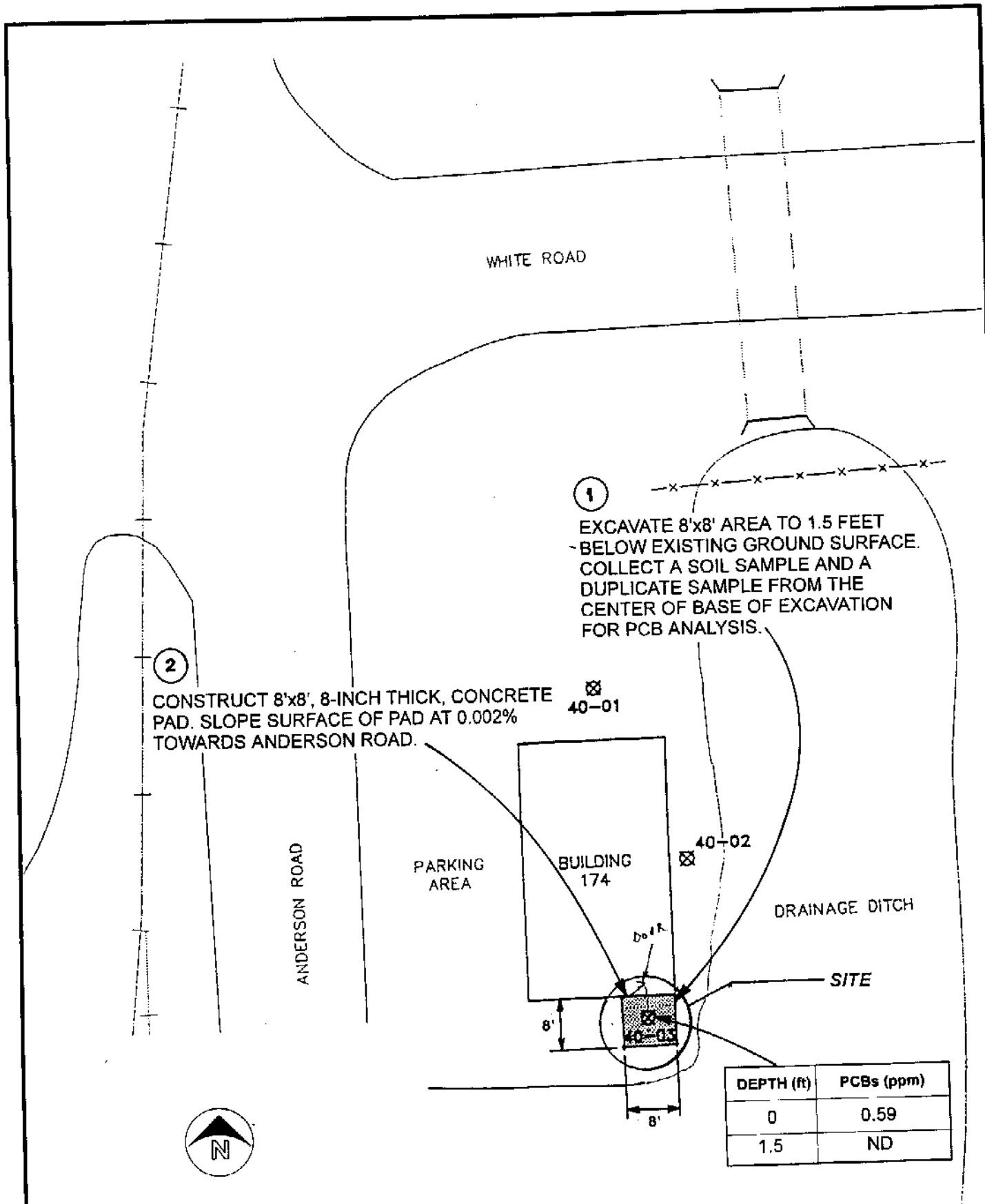


Figure 2.3
Decision Analysis Flow Chart for Soil Sampling at SWMU 16



DEPTH (ft)	PCBs (ppm)
0	0.59
1.5	ND

FIGURE 2-4
CORRECTIVE ACTION PLAN
FOR SMWU 40

CH2MHILL

136175.03.WP

calibrating field equipment and collecting quality control samples. Laboratory analysis QA/QC includes the specification of the quality control methodologies, level of effort (frequency of quality control runs), and quality control parameters. Limits have been identified to ensure data of known and desired quality. QAL will meet or exceed the analytical and quality procedures and parameters outlined in this section.

2.4.1 Calibration of Field Equipment and Responsibilities

A TVA 1000 (photoionization detector [PID]) and an MSA 260 (combustible gas indicator [CGI]) will be used to monitor breathing space air quality in the field. The PID is used to determine the relative total concentration of selected organic and inorganic vapors and gases. These relative concentrations will then be used to specify engineering controls and personal protective equipment. The CGI determines the percentage of lower explosive limit and oxygen concentration, which are used to assess explosive environments or inadequate oxygen supply for working conditions.

A HACH instrument will also be used to determine pH, temperature, electrical conductivity dissolved oxygen, and total dissolved solids of the wastewater samples.

It is the responsibility of each field staff to be familiar with the calibration and operation procedures of the field equipment. Personnel should confirm that the instruments are functioning properly before bringing them to the field. They will be calibrated before each day's use to standards in accordance with procedures and schedules outlined in the particular model's handbook, enclosed in the instruments' cases. Specific air monitoring requirements for this project for the PID, CGI, and dust monitor are specified in CH2M HILL's health and safety plan of this project. The results of calibrations and records of repairs will be recorded in a field notebook.

Scheduled periodic calibration of testing equipment does not relieve field personnel of the responsibility for using properly functioning equipment. If an individual suspects an equipment malfunction, the device will be removed from service and tagged to prevent its inadvertent use, and the appropriate personnel will be notified to facilitate equipment recalibration or substitution. HAZCO also can be contacted at 1-800-332-0435 for technical assistance.

Equipment that fails calibration or becomes inoperable during use will be removed from service either by segregating it to prevent inadvertent use or tagging it to indicate that it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated. Equipment that cannot be repaired will be replaced.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented in the field notebook, and the appropriate personnel will be notified.

Calibration instructions will be included with each instrument and will accompany the instrument to the field.

2.4.2 Field Quality Control Samples

Field quality control samples will be collected and analyzed to assess sample data quality. Quality control samples include field blanks, trip blanks, and sample duplicates. Quality

control samples will be collected at a rate of approximately 5 to 10 percent (1 QC sample for every 10 to 20 sample locations). Quality control samples will be identified as such by description in the field notebook.

QA/QC Samples

QA/QC samples will be submitted to the laboratory with wastewater and sludge samples collected from the septic tanks and excavation areas, respectively. Trip blanks, equipment blanks, and duplicate samplers will be submitted as part of the QA/QC plan. The estimated numbers of these samples are summarized in Table 2.2.

Trip Blanks—The purpose of trip blanks is to detect the potential introduction of contaminants during transportation from the field to the laboratory. Trip blanks will be prepared by the laboratory and consist of organic-free water and will accompany each sealed container (cooler) of field samples to be analyzed for halogenated volatile organics.

Equipment Blanks—Equipment blanks will be collected and analyzed to detect the potential introduction of contaminants during sample collection. Equipment blanks are prepared in the field. These blanks consist of organic-free water poured into the sampling device, collected in the same sample container, and transported to the laboratory for analysis. A minimum of one equipment blank will be collected for each day of sampling.

Field Duplicates—A field duplicate sample will be collected at a frequency of 1 in every 10 samples. The field duplicate is a double volume of sample, collected at the same time and in the same manner as the field sample. Duplicates will be collected and analyzed to check for sampling consistency and error. Duplicate samples will be collected immediately after the primary sample. Ten percent of water samples will be duplicate samples (or a minimum of one duplicate for each parameter suite).

Collected samples will be submitted to QAL, located in Redding, California.

2.4.3 Sample Numbering System

A sample numbering system will be used to identify each wastewater and sludge sample collected. Each sample will be identified with a unique sample identification number. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. A listing of the sample identification numbers will be maintained in the field notebook. The anticipated sample numbering system for the project is summarized in Table 2.2.

2.4.4 Sample Custody and Documentation

Record Keeping

Chain-of-Custody (COC) procedures will be used to maintain and document sample custody. The principal documents used to identify samples and to document custody are COC forms, sample labels, custody seals, and the field notebook.

Custody Transfer and Shipment

Samples are accompanied by a COC record. When transferring samples, the individuals relinquishing and receiving sign, date, and note the time on the record. This record

Table 2.2
Sample Numbering System
Naval Weapons Station, Concord

SWMU Site	Correction Action	Building Number	Wastewater, Sludge, Soil Sample	QA/QC Sample			Total Samples
				Sludge	Soil	Blank	
12	Septic Tank Cleanup	IA-24	W12 and SL12			EB12	3
13	Septic Tank Cleanup	IA-25	W13 and SL13				2
14	Septic Tank Cleanup	IA-27	W 14 and SL14				2
16	Soil Cleanup	IA-46	SS16.1.1 to SS16.N.n		DSB16.N.n		19*
17	Septic Tank Cleanup	IA-50	W17 and SL17				2
20	Septic Tank Cleanup	IA-55	W20 and SL20	DSL20.N			3
23	Septic Tank Cleanup	87	W23 and SL23				2
24	Septic Tank Cleanup	93	W24 and SL24				2
40	Soil Cleanup	174	SS40.1 to SS40.2				2
44	Septic Tank Cleanup	350	W44 and SL44				2
54 (old tank)	Septic Tank Cleanup	79	W54A and SL54A			TB54	2
54 (new tank)	Septic Tank Cleanup	79	W54B and SL54B				2
							43

SL = Sludge
SS = Soil Sample
EB = Equipment Blank
TB = Trip Blank
D = Duplicate Sample
N = Depth of sampling location
n = Consecutive sample taken at N depth
* Will be determined in the field

documents sample custody transfer from the sampler, often through another person, to the laboratory.

Samples are labeled and packaged properly for dispatch to the laboratory with a separate COC record accompanying each shipping container. The method of shipment, courier name(s), and other pertinent information are entered in the Remarks section of the COC record by the laboratory who will ship samples to the contract laboratory.

All shipments are accompanied by the COC record identifying its contents. The original record accompanies the shipment, one copy is kept with QAL and one is kept with CH2M HILL's project file.

When the samples are sent by mail, the package is registered with return receipt requested. If sent by common carrier, a bill of lading is used. Freight bills, postal service receipts, and bills of lading are retained as part of the permanent documentation.

A sample is considered to be under a person's custody when one or more of the following conditions is met:

- Sample is in a person's physical possession
- Sample is in view of the person after the person has taken possession
- Sample is secured by that person in an intamperable state

Chain of Custody

In order to establish the documentation necessary to trace sample possession from the time of collection, a COC record will be filled out and will accompany every sample (soil and water). An example of a COC record form is provided in Figure 2.5.

The record will contain the following minimum information:

- Station location (tied to a sampling location)
- Signature of collector(s)
- Date and time collected
- Sample identification number
- Number of containers
- Analysis to be performed
- Standard method for the analysis
- Matrix type
- Project name and number
- Name of shipper (remarks)
- Date shipped (remarks)
- Signatures of people comprising the chain of possession
- Inclusive dates and times of possession
- Air bus bill number

In order to maintain chain of custody, each person in custody of the sample will sign, date, and note times on the form. Samples in the field will not be left unattended unless placed in a sealed container secured with custody seals, with the COC record inside the container.

CH2M HILL
QUALITY ANALYTICAL LABORATORIES

CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M HILL Project #
Purchase Order #
Project Name
Company Name/CH2M HILL Office
Project Manager & Phone #
Mr. [ ]
Ms. [ ]
Dr. [ ]
Report Copy to:
Requested Completion Date:
Sampling Requirements: SDWA NPDES RCRA OTHER
Sample Disposal: Dispose Return

OF CONTAINERS

LAB TEST CODES
ANALYSES REQUESTED

SHADED AREA – FOR LAB USE ONLY
Lab 1 #
Lab 2 #
Quote #
KK Request #
Project #
No. of Samples
Page
of
COC Rev
Login
LIMS Ver
Ack Gen

Sampling Date	Sampling Time	Type COMP	Type GRAB	Matrix WATER	Matrix SOIL	CLIENT SAMPLE ID (9 CHARACTERS)	REMARKS	LAB 1 ID	LAB 2 ID

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	HAZWRAP/NESSA: Y N	
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	QC Level: 1 2 3 Other:	
Received By (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time	COC Rec	ICE
				Ana Req	TEMP
				Cust Seal	Ph
Received By (Please sign and print name)	Date/Time	Shipped Via UPS BUS Fed-Ex Hand Other		Shipping #	
Work Authorized By (Please sign and print name)	Remarks				

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: ORIGINAL - LAB, Yellow - LAB, Pink - Client
REV 11/92 FORM 340

CH2M HILL

CUSTODY SEAL

Date

Signature

CLIENT/SOURCE	☐ GRAB ☐ COMPOSITE
SITE NAME	DATE/TIME
SAMPLE #	PRESERVATIVE
ANALYSIS	COLL BY

FIGURE 2-5
CHAIN OF CUSTODY RECORD, CUSTODY SEAL, AND SAMPLE LABEL

Labels

Labels will be affixed to all sample containers at the time of sampling. An example of a label is provided in Figure 2.5. Labels will include the following data:

- Sample identification number
- Sample location
- Client name
- Analysis to be performed
- Preservatives in sample
- Date collected and sampler's initials

Custody Seals

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals.

Custody seals are used to detect unauthorized tampering with samples following sample collection and up to the time of analysis. An example of a custody seal is provided in Figure 2.5. The seal will be attached so that it must be broken to open the sample shipping container. Seals will be affixed to each shipping container (i.e., each ice chest) before the samples leave the custody of the sample personnel. Two seals must be placed on each shipping container (cooler), one at the front and one at the back. A seal will include the following information:

- Sampler's signature
- Date collected

Field Notebooks

A field notebook will be maintained by the sampling team leader to provide a daily record of significant events, observations, and measurements during field investigations. All information pertinent to the field survey or sampling effort will be recorded in a log book or equivalent standardized form. Each page or form will be consecutively numbered. All entries will be made in indelible ink and all corrections will consist of line-out deletions that are initialed and dated. Entries in a log book may include the following:

- Name and address of field contact
- Documentation of procedures for preparation of reagent or supplies that become an integral part of the sample (e.g., field blanks)
- Identification of sampling crew members
- Type of sample (e.g., groundwater)
- Number and volume of sample taken (e.g., primary sample, replicate, field blank, and travel blank)
- Sampling methodology
- Sample preservation
- Date and time collected
- Weather conditions
- Sample distribution and how transported (e.g., name of the laboratory and shipping agent)

- Reference, such as maps of the sampling site
- Field observations
- Any field measurements made
- Signature and date by the personnel responsible for observations
- Decontamination procedures

Sampling situations vary widely. No general rules can specify the extent of information that must be entered into a log book or standardized form. However, records will contain sufficient information so that the sampling activity can be reconstructed without relying on the collector's memory.

Laboratory Custody Procedures

A sample custodian accepts custody of the shipped samples and verifies that the sample numbers match that on the COC records. Pertinent information is entered in the Remarks section. The custodian then enters the sample numbers into a logbook, which is arranged by project code and site location.

The laboratory custodian uses the sample identification label number or assigns a unique laboratory number to each sample, and is responsible for seeing that all samples are transferred to the proper analyst or stored in the appropriate area.

2.4.5 Decontamination

All sampling, measurement, and monitoring equipment will be decontaminated and cleaned using the procedures before and after each sampling location and before leaving the site.

Supplies and Materials

The bailers, clamshell, dipper, liquid bomb sampler, dip sticks, beakers, buckets, and other reusable materials will initially be washed in trisodium phosphate cleaning solution. They will then be rinsed with clean water, then rinsed with isopropanol, rinsed with organic-free water, and then allowed to dry.

Sampling Equipment

The equipment and its associated attachments and fittings will also be decontaminated, as specified above, whichever parts contact the sampling medium, before and following its use for each sample.

The handling and disposal of decontaminated water is described in Section 4.2, Waste Management Plan.

2.4.6 Laboratory Quality Assurance

The QA objective of this project is to develop and implement procedures that will provide data of known and appropriate quality. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. Definitions of these parameters, the applicable procedures, and level of effort are described below. The applicable QC procedures, quantitative target limits, and levels of effort for assessing data quality are

dictated by the intended use of the data and the nature of the analytical methods as further described below.

For this project, the analytical parameters are designed to provide data to assess the septic tank contents in order to be able to appropriately dispose the them (listed in Table 2.1). The soil will be analyzed for parameters to determine that the excavation is done to the extent required to deem it clean, and to determine the appropriate method of soil disposal.

Table 2.3 lists the specific analytical method, target detection limit, accuracy, precision, and completeness for each parameter. A description of the data quality parameters follows.

Detection limits are established as described in *"Definition and Procedure for the Determination of the Method Detection Limit, EPA 600-4-82-057, 7.82, Appendix A or 40 CFR Part 136 Appendix B."* During measurement of an actual sample, detection limits may be elevated because of interference from other components in the sample matrix. Matrix interference will be reported by the laboratory if it occurs, and therefore results in elevated detection limits.

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the water or soils sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., for storage, preservation, and transportation) have been developed Sections 2.1, 2.2, 2.3, and Table 2.1. The proposed documentation will establish that protocols have been followed and sample identification and integrity assured. Field blanks and duplicates will be collected at a total minimum 10-percent frequency, and will be used to assess field and transport contamination and method variation, respectively. Laboratory method blanks will be run at a minimum frequency of 5 percent or 1 per batch of samples processed at the same time, whichever is more frequent, to assess laboratory contamination.

Comparability of the data will be maintained by using EPA-defined procedures where available. In addition, data comparability will be maintained by use of consistent methods and units throughout the sampling event. Table 2.3 lists specific parameters, analytical methods, and target detection limits.

Accuracy is an assessment of the closeness of the measured value to the true value. Accuracy of analytical results are assessed by spiking samples with known standards and establishing the average recovery. In general, for organic compounds, two types of recoveries are measured: (1) matrix spike recoveries and (2) surrogate spike recoveries. For a matrix spike, known amounts of standard compounds identical to the compounds present in the sample of interest are added to the sample. For a surrogate spike, the standards are chemically similar but not identical to the compounds being analyzed in the fraction. The purpose of the surrogate spike is to provide QC on every sample by constantly monitoring for unusual matrix effects and gross sample processing errors. For inorganic compounds in general, only matrix spikes are measured. A quantitative definition of averaged recovery (accuracy) is given this section. Accuracy measurements will be carried out with a minimum frequency of 1 matrix spike in 20 or 1 per batch of samples analyzed under the same sampling episode. Target quantitative accuracy objectives are listed, as applicable, in Table 2.2.

Precision of the data is a measure of the spread of the data when more than one measurement is taken on the same sample. For duplicate sample measurements, precision

Table 2.3
Quality Assurance and Control Parameters
Naval Weapons Station, Concord

Constituents	Acronym	Medium	Laboratory Methods	Target Detection Limit	Units	Accuracy (Percent Recovery Limits)	Precision (Relative Percent Deviation)	Completeness
Field Methods								
Temperature	T	Wastewater, Sludge	E170.1	0.1	°F	0.10%	+/- 0.5%	95%
pH	pH	Wastewater, Sludge	SW9040	0.1	none	99-101%	+/- 0.2%	95%
Electrical Conductivity	EC	Wastewater, Sludge	SW9050	1	µmhos/cm	94-106%	+/- 0.2%	95%
Total Dissolved Solids	TDS	Wastewater, Sludge	E160.1	3	mg/L	92-107%	+/- 3%	95%
Dissolved Oxygen	DO	Wastewater, Sludge	EPA 360.1		mg/L	92-107%	+/- 3%	95%
DDT	DDT	Soil	SW4042	0.1	mg/Kg	90% Agreement with Confirmation	+/- 3%	95%
Polychlorinated Biphenyls	PCB	Soil	SW4020	1	µg/Kg	90% Agreement with Confirmation	+/- 3%	95%
Laboratory Methods								
DDT	DDT	Soil	SW8080	7.4	mg/Kg	25-160%	+/-50%	95%
Polychlorinated Byphenyls	PCBs	Soil	SW8080	(a)	(a)	(a)	(a)	95%
Antimony	Sb	Wastewater, Sludge	EPA- CLP SOW	60	µg/L	75-125%	+/-20%	95%
Arsenic	As	Wastewater, Sludge	EPA- CLP SOW	10	µg/L	75-125%	+/-20%	95%
Cadmium	Cd	Wastewater, Sludge	EPA- CLP SOW	5	µg/L	75-125%	+/-20%	95%
Chromium (total)	Cr	Wastewater, Sludge	EPA- CLP SOW	10	µg/L	75-125%	+/-20%	95%
Copper	Cu	Wastewater, Sludge	EPA- CLP SOW	25	µg/L	75-125%	+/-20%	95%
Lead	Pb	Wastewater, Sludge	EPA- CLP SOW	3	µg/L	75-125%	+/-20%	95%
Mercury	Hg	Wastewater, Sludge	EPA- CLP SOW	0.2	µg/L	75-125%	+/-20%	95%
Nickel	Ni	Wastewater, Sludge	EPA- CLP SOW	40	µg/L	75-125%	+/-20%	95%
Selenium	Se	Wastewater, Sludge	EPA- CLP SOW	5	µg/L	75-125%	+/-20%	95%
Silver	Ag	Wastewater, Sludge	EPA- CLP SOW	10	µg/L	75-125%	+/-20%	95%
Thallium	Tl	Wastewater, Sludge	EPA- CLP SOW	10	µg/L	75-125%	+/-20%	95%
Zinc	Zn	Wastewater, Sludge	EPA- CLP SOW	20	µg/L	75-125%	+/-20%	95%
Cyanide	CN	Wastewater, Sludge	EPA- CLP SOW	10	µg/L	75-125%	+/-20%	95%
Phenolic Compounds		Wastewater, Sludge	EPA625	(a)	µg/L	(a)	(a)	95%
pH	pH	Wastewater, Sludge	SW9040	0.1	none	95-105%	+/-0.2%	95%
Oil and Grease		Wastewater, Sludge	SM5520B	5	mg/L	60-140%	+/-12%	95%
Mineral (Hydrocarbons)		Wastewater, Sludge	SM5520F	5	mg/L	60-140%	+/-12%	95%
Animal and Vegetable (Fatty Acids)		Wastewater, Sludge	SM5520B-SM5520F	5	mg/L	60-140%	+/-12%	95%
Total Toxic Organics	TTO	Wastewater, Sludge	EPA 624	(a)	mg/L	(a)	(a)	95%
Total Toxic Organics	TTO	Wastewater, Sludge	EPA 625	(a)	mg/L	(a)	(a)	95%
Chlorinated Pesticides		Wastewater, Sludge	EPA 608	(a)	mg/L	(a)	(a)	95%
Polychlorinated Biphenyls	PCBs	Wastewater, Sludge	EPA 608	(a)	mg/L	(a)	(a)	95%
Biochemical Oxygen Demand	BOD	Wastewater, Sludge	EPA 405.1	3	mg/L	75-130%	+/- 8%	95%
Total Suspended Solids	TSS	Wastewater, Sludge	EPA 160.2	3	mg/L	70-120%	+/- 7%	95%
Chemical Oxygen Demand	COD	Wastewater, Sludge	EPA 410.4	7	mg/L	80-120%	+/- 5%	95%

(a) See attached Table C in Appendix A.

can be expressed as the relative percent difference. A quantitative definition of the relative percent difference is given in this section. The level of effort for precision measurements will be a minimum of 1 laboratory duplicate in 20 or 1 per batch of samples analyzed. Target quantitative precision objectives are specified in Table 2.3 for the specific procedures.

Completeness is a measure of the amount of valid unqualified analytical results divided by the number of possible individual analyte results from all samples collected, expressed as a percentage. The quantitative definition of completeness is given in this section. The objective for completeness will be 95 percent for each analyte, as well as for the whole sampling aspect as a whole. Completeness may depend on the intrinsic nature of the samples (i.e., data usability effects from matrix interference) that is out of the control of the field crew and/or laboratory and this will not count against the completeness goal. The completeness of the data will be assessed during QC reviews.

2.4.7 Data Quality Management

Data flow and data quality management procedures are described below.

Data Reduction, Validation, and Reporting

Data for all parameters will undergo two levels of review and validation: (1) at the laboratory and (2) outside the laboratory.

Initial data reduction, validation, and reporting at the laboratory will be carried out according to the specific requirements listed in Table 2.3.

Data will be reviewed outside the laboratory by a CH2M HILL chemist. Data will be reviewed with regard to the following: analytical method, QC procedures, QC frequency requirements, and compliance with control limits QAL will review data on a Level 2 process which will include flagging non-detected analytes and those levels out of control. Other QA/QC problems listed below should be noted in writing on the reports:

- Analyte detected in blanks
- Lost analysis
- Estimated values
- Duplicate injection precision not met
- Method of standard additions used
- Post-digestion spike (HGA) outside of control limits
- Calibration correlation coefficient <0.995
- Concentration outside of calibration range
- Compounds using secondary dilution factor
- Suspected Aldol-condensation product
- Presumptive evidence of a compound
- GC/MS confirmation

The second level of review will consist of data quality evaluation and flagging using the U.S. EPA Contract Laboratory Program National Functional Guidelines for Data Review (1994) and this Quality Assurance Performance Plan (QAPP) as guidance.

Data Assessment Procedures

Data assessment will follow the data review and validation described in the preceding section. An assessment report will summarize the findings of the data review/validation as relevant to project usage. Data accuracy, precision, and completeness values will be summarized in the assessment report. The following sections present the quantitative definitions of accuracy, precision, and completeness.

Accuracy. For spiked samples, the recovery (R) can be defined as a measure of accuracy:

$$\%R = \frac{(S-U)}{Csa} \times 100$$

where:

%R	=	Percent recovery
S	=	Measured concentration in spiked aliquot
U	=	Measured concentration in non-spiked aliquot
Csa	=	Actual concentration of spike added

Precision. This section provides the basis for the quantitative limits used to control data precision. The primary measurement of data precision will be the relative percent difference (RPD) between a duplicate pair of data points:

$$RPD = \frac{(X2 - X1)}{[(X1+X2)/2]} \times 100$$

where:

X1	=	First duplicate point value
X2	=	Second duplicate point value

Completeness. Measurement completeness (C) can be described as the ratio of acceptable measurements obtained to the total number of planned measurements for an activity. Percent completeness can be defined as:

$$C = \frac{\text{Number of acceptable data per target quality control limits}}{\text{Total number of data points}} \times 100$$

2.5 Field Work QA/QC Responsibilities

The site investigation field leader has the primary responsibility for executing investigation field work at the Naval Weapons Station, Concord in accordance with the field workplan. Claudia Cornejo is the environmental engineer assigned as the site investigation field leader. She will be responsible for overseeing that the field investigation activities are carried out successfully and in accordance with the workplan. She will supervise all day-to-day field-related activities. If work progress or any other problems arise during the field investigation, the site investigation field leader will report to Winifred Au, project manager, to discuss and resolve all problems. Field responsibilities will include documentation of proper sample collection protocols; sample collection; field

measurements; equipment calibration, maintenance, and decontamination; and sample documentation.

3. Health and Safety Plan

Attached is our certified Health and Safety Plan.

CH2M HILL Health and Safety Plan

for

Naval Weapons Station, Concord

July 24, 1996

Table of Contents

Table of Contents (Continued)

CH2M HILL HEALTH AND SAFETY PLAN

(Reference CH2M HILL SOP 19, *Health and Safety Plans*)

This health and safety plan will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOP) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* and CH2M HILL's *Site safety Notebook* as appropriate. The site safety coordinator (SSC) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment 1. In addition, this plan adopts procedures in the work plan for the project.

1 PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: Navy Public Works Center (Client)
Naval Weapons Station, Concord (Owner)

PROJECT NO: 136175.03.WP

CH2M HILL PROJECT MANAGER: Winifred Au **OFFICE:** SFO

SITE NAME: Naval Weapons Station, Concord

SITE ADDRESS: Code 09203 - Port Chicago Highway, Concord, CA 94520-5000

DATE HEALTH AND SAFETY PLAN PREPARED: July 15, 1996

DATE(S) OF INITIAL VISIT: August 5, 1996

DATE(S) OF SITE WORK: August 5, 1996 - December 30, 1996

SITE ACCESS: Listing of onsite personnel will be faxed to the Navy one week before work begins. Badges are required at the facility. Access to all sites will be provided by Navy personnel.

SITE SIZE: The size of the total area which encompasses the Tidal, Inland, and the radiography facility, is about 13,000 acres. Within this area are the working sites SWMU 12, 13, 14, 16, 17, 20, 23, 24, 40, 44, and 54.

SITE TOPOGRAPHY: SWMU 16 is partly paved (partly unpaved with asphalt), and SWMU 40 has gravel ground cover. The rest of the sites have grass and dirt coverings (unpaved).

PREVAILING WEATHER: Temperate. Mild temperatures and humidity. Windy and foggy on occasions.

SITE DESCRIPTION AND HISTORY: The work areas are located within the Tidal and Inland areas of the Naval Weapons Station in Concord, California. The main mission of the Station is to handle, ship, maintain, overhaul, and service munitions. Various chemicals have been detected within the facility including the following chemicals of concern: pesticides (particularly DDT), asbestos, PCBs, metals (including arsenic), diesel, benzene, toluene, ethylbenzene, and xylenes. This plan is part of the RCRA corrective action scheduled to take place at 11 locations: SWMU Sites 16 and 40 contaminated soil will be removed from surface to 1 to 3 feet below grade. The sites will then be backfilled and the ground surface will be restored. The contaminated soil will be analyzed for proper disposal. For other nine septic tank sites the contents of the tanks will be sampled and pumped out for proper disposal. The tanks will be rinsed and the rinse water will be sampled for proper disposal. For detailed historical information, reference this project's Workplan.

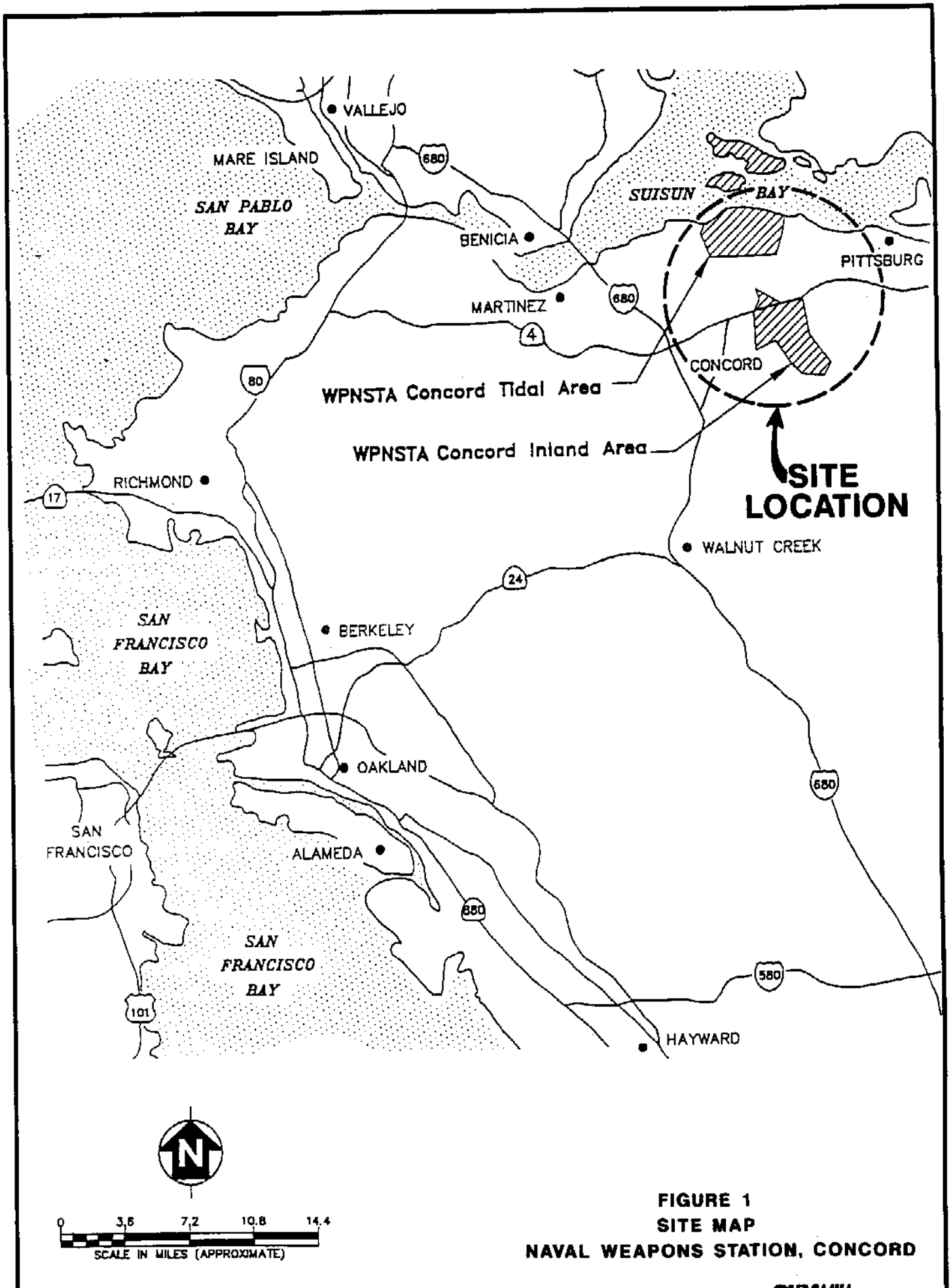


FIGURE 1
SITE MAP
NAVAL WEAPONS STATION, CONCORD

CH2M HILL

136175.03.WP

2 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

CLIENT: Pete Zucca, Project Manager, Navy Public Works Center
Harold Kailhiwa, Foreman, Navy Public Works Center
Richard Pieper, Facilities Division Director, Naval Weapons Station, Concord

CH2M HILL:
Project Manager: Winifred Au/ SFO
Field Team Leader: Claudia Cornejo/SJC
Refer to Section 4 for field staff.

CONTRACTORS and SUBCONTRACTORS: Refer to Section 4.2.

2.2 DESCRIPTION OF TASKS (Reference Section 1, "Field Activity Start-up Form," of *Site Safety Notebook*

Refer to project documents (i.e., work plan) for detailed task information. A health and safety risk analysis has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below require an approved amendment to this plan before additional work begins. Refer to Section 10.2 for procedures related to tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

2.2.1 HAZWOPER-REGULATED TASKS

- Surface soil sampling and disposal of contaminated soils
- Septic tank sampling and disposal of septage and sludge
- Observation of loading of material for offsite disposal
- Observation of construction

2.2.2 NON-HAZWOPER-REGULATED TASKS

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.**

TASK	RESTRICTIVE CONDITIONS
• Oversight of general heavy equipment work (e.g. excavation, grading of pavement)	

3 HAZARD EVALUATION AND CONTROL

3.1 HEAT AND COLD STRESS (Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

3.1.1 PREVENTING HEAT STRESS

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50° to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

3.1.2 SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash (*miliaria rubra*, "prickly heat")	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool– but not cold water. Call ambulance, and get medical attention immediately!

3.1.3 HEAT-STRESS MONITORING

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high(>50%), or when the workers exhibit symptoms of heat stress.

The heart rate should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats/minute, or 20 beats/minute above resting pulse.

3.1.4 PREVENTING COLD STRESS

- Be aware of the symptoms of cold-related disorders, and ***wear proper clothing for the anticipated fieldwork.***
- Consider monitoring the work conditions and adjusting the work schedule, using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- ***Wind-Chill Index.*** This measure relates the dry bulb temperature and the wind velocity. It is used only to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index sometimes is limited in its usefulness because the index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it is used only as a guideline to warn workers when they are in a situation that can cause cold-related illnesses. Used in conjunction with the NSC guidelines, the wind-chill index provides a starting point for adjusting work and warm-up schedules.
- ***NSC Guidelines for Work and Warm-Up Schedules.*** The cold-exposure limits recommended by the NSC can be used in conjunction with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; ***workers should be monitored for symptoms of cold-related illness.*** If symptoms are not observed, the work duration can be increased.
- The wind-chill index and the NSC guidelines are in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* SOP HS-09.

3.1.5 SYMPTOMS AND TREATMENT OF COLD STRESS

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

3.2 PROCEDURES FOR LOCATING BURIED UTILITIES

Local Utility Mark-Out Service
Name: Harold, Kailhiwa, Navy Public Works Center
Phone: 510/231-8395

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural-gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary, clear locations with a utility-locating instrument (e.g., metal detector).
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually.
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon).
- When the client or other on-site party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

3.3 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls are to be implemented by the party in control of the site or the hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees and subcontractors must, at a minimum, remain aware of hazards affecting them regardless of who is responsible for controlling the hazards. Specialty subcontractors are responsible for the safe operation of their equipment (e.g., drill rig, heavy equipment). CH2M HILL employees are not to operate, or assist in the operation of, any subcontractor or contractor equipment.

		Tasks			
Hazard (Refer to SOP, or HSP Section)	**Engineering Controls, Administrative Controls, and Work Practices**	**Excavation and Surface Soil Sampling**	**Septic Tank Sampling and Disposal***	**Observation of Loading of Material for Offsite Disposal**	**Remediation and Construction Oversight**
Flying debris/objects (HS-07)	Provide shielding and PPE; maintain distance.	X	X	X	X
Noise > 85 dBA	Noise protection and monitoring required.	X		X	X
Gas cylinders (HS-21)	Instruct employees in the safe use of compressed gases. Make certain gas cylinders are properly anchored and chained. Keep cylinders away from ignition sources. Cap cylinders when not in use.	X	X		
Electrical	PWC will perform a high voltage above-ground and under-ground Clearance for SWMU 16 and 40. Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so. Ground as appropriate. Project field sites should have ground fault circuit interrupters (GFCIs) installed for all wiring, including extension cords. Heavy equipment (e.g., drill rig) should remain at least 15 feet from overhead power line for power lines of 50 kV or less. For each 10 kV > 50, increase distance by ½ foot. Operate and maintain equipment according to manufacturer's instructions. Use only extension cords that are three-wire grounded. Cords passing through work areas must be covered or elevated to protect from damage. Use only electrical tools and equipment that are either effectively grounded or double-insulated UL approved. Properly label switches, fuses, and circuit breakers. Remove cord from an outlet by grasping the plug, not pulling the cord.	X			X

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		Tasks			
Hazard (Refer to SOP, or HSP Section)	**Engineering Controls, Administrative Controls, and Work Practices**	**Excavation and Surface Soil Sampling**	**Septic Tank Sampling and Disposal**	**Observation of Loading of Material for Offsite Disposal**	**Remediation and Construction Oversight**
	Protect all electrical equipment, tools, switches, etc., from elements. Avoid physical contact with power circuit. Only qualified electricians are to install and work on electrical circuits and equipment.	X			X
Suspended loads	Work not permitted under suspended loads.	X		X	X
Buried utilities, drums, tanks, etc. (Section 3.3)	Locate buried utilities, drums, tanks, etc., before digging or drilling and mark location.	X			X
Slip, trip, fall hazards (e.g., wet/muddy surface, inadequate railing, unstable surface)	Provide slip-resistant surfaces, ropes, and/or other devices to be used. Brace and shore equipment	X	X	X	X
Back injury (HS-29)	Use proper lifting techniques, or provide mechanical lifting aids.	X	X		X
Confined space entry (Section 9.0)	Space must be evaluated by qualified person. Additional controls and monitoring, training, and an approved entry permit are generally required.	NOT APPLICABLE			
Trenches/excavations (HS-32)	Make certain trench meets OSHA standard before entering. All excavations > 4 feet deep must be sloped or shored, and have a ladder every 25 feet. Personnel and equipment must remain at least 2 feet from edge of trench at all times.	X			X
Protruding objects	Flag visible objects.	X	X	X	X
Visible lightning	Stop work.	X	X	X	X
Vehicle traffic (HS-24)	Provide temporary traffic controls, including trained flaggers and lookouts. Implement traffic control program when required.	X		X	X

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		Tasks			
Hazard (Refer to SOP, or HSP Section)	**Engineering Controls, Administrative Controls, and Work Practices**	**Excavation and Surface Soil Sampling**	**Septic Tank Sampling and Disposal'**	**Observation of Loading of Material for Offsite Disposal**	**Remediation and Construction Oversight**
Stairways, ladders, and scaffolds (HS-25)	Stairways and ladders are generally required when there is a break in elevation of 19 inches or more. Keep access ways clear. Equipment must meet OSHA specifications. Document employee training.				X
Elevated work area/falls (HS-31)	Provide guardrail, safety net, floor covers, body harness, and monitoring system, where applicable. Document employee training.	X			X
Fire prevention and control (HS-22)	No spark sources are allowed within exclusion or decontamination zones. Appropriate firefighting equipment must be available on the site. Extinguishers are to be inspected visually every month and undergo an annual maintenance check. Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations. Keep areas near exits and extinguishers clear. Open flames are prohibited in the vicinity of flammable materials. Combustible materials stored outside should be at least 10 feet from the building. Unnecessary combustible materials and flammable or combustible liquids must not be allowed to accumulate. Flammable or combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.	X	X		X
Inadequate illumination	Site work will be performed during daylight hours whenever possible. Work conducted during hours of darkness will require enough illumination intensity "to read a newspaper without difficulty."	X	X	X	X
Heavy equipment	Become familiar with hazards specific to the equipment being used. Always confirm that the operator is aware of your location, particularly	X		X	X

3.3 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls are to be implemented by the party in control of the site or the hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees and subcontractors must, at a minimum, remain aware of hazards affecting them regardless of who is responsible for controlling the hazards. Specialty subcontractors are responsible for the safe operation of their equipment (e.g., drill rig, heavy equipment). CH2M HILL employees are not to operate, or assist in the operation of, any subcontractor or contractor equipment.

		Tasks			
Hazard (Refer to SOP, or HSP Section)	**Engineering Controls, Administrative Controls, and Work Practices**	**Excavation and Surface Soil Sampling**	**Septic Tank Sampling and Disposal'**	**Observation of Loading of Material for Offsite Disposal**	**Remediation and Construction Oversight**
	when you approach or pass by equipment. Backup alarm is required for heavy equipment. Do not count on backup alarms always functioning. Look around when alarm sounds. Do not ride equipment not designed for passengers. Do not climb on operating equipment. Do not place yourself between fixed and moving parts or objects. Do not stand adjacent to the equipment. Stay clear of equipment on cross slopes and unstable terrain. Stay clear of pile-driving operations. Stay outside the turning radius of the equipment. Operators using all-terrain vehicles (ATV) must be trained; other ATV requirements may apply. Observer must remain in contact with operator and signal safe backup. Personnel must remain outside the turning radius.	X		X	X
IDW Drum sampling	Personnel are allowed to handle and/or sample drums containing investigation-derived waste (IDW) only; handling or sampling other drums requires a plan revision or amendment approved by the CH2M HILL HSM. The following control measures will be taken when sampling drums containing IDW: Minimize transportation of drums. Minimize number of people involved in the actual sampling.		X		

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		Tasks			
Hazard (Refer to SOP, or HSP Section)	**Engineering Controls, Administrative Controls, and Work Practices**	**Excavation and Surface Soil Sampling**	**Septic Tank Sampling and Disposal***	**Observation of Loading of Material for Offsite Disposal**	**Remediation and Construction Oversight**
	Sample only labeled drums or drums known to contain IDW. Use caution when sampling bulging or swollen drums. Relieve pressure slowly. If drums contain, or potentially contain, flammable materials, use nonsparking tools to open. Picks, chisels, and firearms may not be used to open drums. Reseal bung holes or plugs whenever possible. Avoid mixing incompatible drum contents. Sample drums without leaning over the drum opening. If there is evidence of contamination on the lid of the drum, cover the lid with plastic sheeting. Transfer the content of drums using a method that minimizes contact with material. Air monitoring and PPE requirements specified in sections 5 and 6 must address drum sampling. Spill-containment procedures specified in Section 8 must be appropriate for the material to be handled.		X		

3.4 BIOLOGICAL HAZARDS AND CONTROLS

Hazard and Location	Control Measures
Snakes typically are found in underbrush and tall grassy areas.	If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings.
Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.	Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.
Exposure to **blood-borne pathogens** may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material, or when coming into contact with landfill waste or waste streams containing such infectious material.	Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Blood-borne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.
Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.	Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

Other Potential Biological Hazards:
none

3.5 TICK BITES (Reference CH2M HILL HS-03, *Tick Bites*)

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

Prevention against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permanone, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

If bitten by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

3.6 RADIOLOGICAL HAZARDS AND CONTROLS

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual*, and *Corporate Health and Safety Program, Radiation Protection Program Manual*, for standards of practice for operating in contaminated areas.

Hazards	Controls
None Known	None Required

3.7 HAZARDS POSED BY CHEMICALS BROUGHT ON THE SITE

3.7.1 HAZARD COMMUNICATION

(Reference CH2M HILL *Hazard Communication Manual* and Section 5 of the *Site Safety Notebook*)

CH2M HILL's *Hazard Communication Program Manual,* which is available from area or regional offices and from the Corporate Human Resources Department in Denver. The project manager is to request Material Safety Data Sheets (MSDSs) from the client or from the contractors and the subcontractors for chemicals to which CH2M HILL employees potentially are exposed. The SSC is to do the following:

- Give employees required site-specific HAZCOM training.
- Confirm that the inventory of chemicals brought on the site by subcontractors is available.
- Before or as the chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, if any.

The chemical products listed below will be used on the site. Refer to Attachment 2 for MSDSs.

Chemical	Quantity	Location
Methane (calibration gas)	1 liter, compressed gas	Support Zone
Isobutylene (calibration gas)	1 liter, compressed gas	Support Zone
Pentane (calibration gas)	1 liter, compressed gas	Support Zone
Hydrochloric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Nitric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Sulfuric Acid (sample preservative)	< 500 ml	Support/Exclusion Zone
Sodium Hydroxide (sample preservative)	< 500 ml	Support/Exclusion Zone
Isopropanol (decontamination solvent)	< 1 gallon	Support/Decontamination Zone
pH Buffers (calibration standard)	< 500 ml	Support Zone
MSA Sanitizer (respirator cleaner)	< 1 liter, powder	Support/Decontamination Zone
Alconox/Liquinox (detergent)	< 1 liter, powder/liquid	Support/Decontamination Zone

3.7.2 SHIPPING AND TRANSPORTATION OF CHEMICAL PRODUCTS

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods*)

Nearly all chemicals brought to the site are considered hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive the CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.8 KNOWN CONTAMINANTS OF CONCERN					
Contaminant	**Location and Highest Concentration**	**PEL, REL, or TLV[a]**	**IDLH[b]**	**Symptoms and Effects of Exposure**	**PIP[c] eV**
1,1,1-Trichloroethane	SB: SWMU 13; 2,700	350 ppm	700 ppm	Headache, lassitude, CNS depression, poor equilibrium, eye irritation, dermatitis	11.00
1,1,2-Trichloroethane	SB: SWMU 13; 12,000	10 ppm Ca[d]	100 ppm	Eye and nose irritation, CNS depression	11.00
1,3-Dichlorobenzene	SL: SWMU 54; 0.120	10 ppm Ca	150 ppm	Headache, eye irritation, nausea, vomiting, profuse rhinitis	8.98
1,4-Dichlorobenzene	SB SWMU 13; 33 SL: SWMU 44; 0.0084	10 ppm Ca	150 ppm	Headache, eye irritation, nausea, vomiting, profuse rhinitis	8.98
1,4-Dichlorophenol	SL: SWMU 54; 0.059	NL[e]	NL	No information found in the NIOSH[f] pocket guide	NL
2,6-Dinitrotoluene	SL: SWMU 13; 1	NL	NL	No information found in the NIOSH pocket guide	NL
4,4'-DDD	SB: SWMU 16; 120	0.5 mg/m^3 Ca	NL	Confirmed carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data	NL
4,4'-DDE	SB: SWMU 16; 42	0.5 mg/m^3 Ca	NL	Confirmed carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data	NL
4,4'-DDT	SB: SWMU 16; 2,100	0.5 mg/m^3 Ca	500 mg/m^3	Paresthesia tongue, lips, and face; tremors; dizziness; confusion; headache; fatigue; convulsions; eye and skin irritation	NL
4-Methylphenol	SB: SWMU 16; 34 SL: SWMU 23; 0.023	NL	NL	No information found in the NIOSH pocket guide	NL
4-Nitrotoluene	SB: SWMU 13; 0.1	2 ppm	200 ppm	No information found in the NIOSH pocket guide	NL
Aldrin	SB: SWMU 16; 77	0.25 mg/m^3	25 mg/m^3	Headache, dizziness, nausea, vomiting	NL
Alpha BHC	SB: SWMU 13; 0.04	Ca	NL	Carcinogen with experimental carcinogenic, tumorigenic, and neoplastigenic data; poison by ingestion; mutation data reported	NL
Alpha-chlordane	SB: SWMU 16; 330	NL	NL	No information found in the NIOSH pocket guide	NL

3.8 KNOWN CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration	PEL, REL, or TLV[a]	IDLH[b]	Symptoms and Effects of Exposure	PIP[c] eV
Aluminum	SB: SWMU 16; 23,100	5 mg/m^3	NL	No information found in the NIOSH pocket guide	NL
Antimony	SB: SWMU 13; 3.2 SL: SWMU 23; 0.11	0.5 mg/m^3	50 mg/m^3	Nose, throat, and mouth irritation; coughing; headache; nausea; vomiting; diarrhea; stomach cramps; skin irritation; unable to smell properly	NL
PCB (48% Chlorine) Chlorodiphenyl	SB: SWMU 40; 0.4	0.001 mg/m^3 Ca	5 mg/m^3	Eye and skin irritation, acne-form dermatitis	NL
PCB (54% Chlorine) Chlorodiphenyl	SB: SWMU 40; 0.2	0.001 mg/m^3 Ca	5 mg/m^3	Eye and skin irritation, acne-form dermatitis	NL
PCB (60% Chlorine) Chlorodiphenyl	SB: SWMU 40; 0.07	0.001 mg/m^3 Ca	5 mg/m^3	Eye and skin irritation, acne-form dermatitis	NL
Arsenic	SB: SWMU 16; 23.7	0.002 mg/m^3 C^a Ca	5 mg/m^3	Ulceration of nasal septum, dermatitis, GI disturbances, respiratory irritation	NL
Barium	SB: SWMU 13; 879 SL: SWMU 12; 33	0.5 mg/m^3	1,100 mg/m^3	Upper respiratory irritation, muscle spasms, slow pulse, eye and skin irritation, skin burns	NL
Benzoic Acid	SL: SWMU 23; 0.64	NL	NL	No information found in the NIOSH pocket guide	NL
Benzyl butyl phthalate	SL: SWMU 23; 0.005	NL	NL	No information found in the NIOSH pocket guide	NL
Beryllium	SB: SWMU 13; 0.39	0.0005 mg/m^3 C Ca	4 mg/m^3	Respiratory symptoms, weakness, fatigue, weight loss	NL
Beta BHC	SB: SWMU 13; 0.02	Ca	NL	Carcinogen with experimental neoplastigenic data; mildly toxic by ingestion	NL
Cadmium	SL: SWMU 12; 1.9	0.002 mg/m^3 Ca	9 mg/m^3	Pulmonary edema, coughing, chest tightness, headache, chills, muscle aches, nausea, vomiting, diarrhea	NL
Calcium	SB: SWMU 13; 19,700	NL	NL	No information found in the NIOSH pocket guide	NL
Chloroform	SL: SWMU 13; 4	2 ppm Ca	500 ppm	Dizziness, mental dullness, nausea, disorientation, headache, fatigue, eye and skin irritation	11.42
Chromium	SB: SWMU 13; 248	0.5 mg/m^3	250 mg/m^3	Eye and skin irritation: lung fibrosis	NL

3.8 KNOWN CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration	PEL, REL, or TLV[a]	IDLH[b]	Symptoms and Effects of Exposure	PIP[c] eV
	SL: SWMU 12; 6.0				
Chrysene	SB: SWMU 13; 0.5	0.2 mg/m^3	NL	Carcinogenic	NL
Cobalt	SB: SWMU 12; 30	0.05 mg/m^3	20 mg/m^3	Coughing, decreased pulmonary function, dermatitis, respiratory hypersensitivity	NL
Copper	SB: SWMU 13; 525	1 mg/m^3	100 mg/m^3	Eye, nose pharynx irritation; nasal perforation; metallic taste; dermatitis; lung, liver, and kidney damage; anemia	NL
Dieldrin	SB: SWMU 16; 170	0.25 mg/m^3 Ca	50 mg/m^3	Headache, dizziness, nausea, vomiting, sweating	NL
Diesel	SB: SWMU 40; 8	NL	NL	No information found in the NIOSH pocket guide	NL
Diethylphthalate	SL: SWMU 23; 0.0045	NL	NL	No information found in the NIOSH pocket guide	NL
Endosulfan II	SB: SWMU 13; 0.01	NL	NL	No information found in the NIOSH pocket guide	NL
Fluoranthene	SB: SWMU 13; 0.9	0.2 mg/m^3	NL	Toxic by ingestion and skin contact	NL
Gamma BHC	SB: SWMU 16; 350	NL	NL	Moderately toxic by ingestion	NL
Heptachlor Epoxide	SB: SWMU 16; 160	NL	NL	Poisonous by ingestion	NL
Iron	SB: SWMU 13; 36,000	10 mg/m^3	NL	Vomiting, bloody black stools, shock, metabolic acidosis	NL
Lead	SB: SWMU 13 676 SS: SWMU 12; 30	0.05 mg/m^3	100 mg/m^3	Weakness, lassitude, facial pallor, abdominal pain, constipation	NL
Magnesium	SL: SWMU 13; 14,700 SS: SWMU 13; 13,500	NL	NL	No information found in the NIOSH pocket guide	NL
Manganese	SB: SWMU 13; 16,000 SL: SWMU 13; 0.161	1 mg/m^3	500 mg/m^3	Mental confusion, metal fume fever, dry throat, coughing, tight chest, flu-like fever, vomiting, fatigue	NL
Mercury	SB: SWMU 13; 0.24 SL: SWMU 17; 0.12	0.05 mg/m^3	10 mg/m^3	Coughing, chest pains, tremors, irritability, indecision, headache, fatigue, weakness, eye and skin irritation	NL

3.8 KNOWN CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration	PEL, REL, or TLV[a]	IDLH[b]	Symptoms and Effects of Exposure	PIP[c] eV
Molybdenum	SB: SWMU 13; 1.6	10 mg/m^3	5,000 mg/m^3	In animals: eye, nose and throat irritation, diarrhea, listlessness	NL
Motor Oil	SB: SWMU 40; 26	NL	NL	No information found in the NIOSH pocket guide	NL
Naphthalene	SB: SMWU 13; 2	10 mg/m^3	250 ppm	Eye irritation, headache, confusion, excitement, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, dermatitis	8.12
Nickel	SB: SWMU 13; 145	0.015 mg/m^3	10 mg/m^3	Headache, vertigo, nausea, vomiting, coughing, weakness	NL
Oil & Grease	SB: SWMU 13; 920	5 mg/m^3	2,500 mg/m^3	Eye, skin and respiratory irritation	NL
Phenanthrene	SB: SWMU 13; 0.05	0.2 mg/m^3	NL	Irritation	NL
Phenol	SB: SWMU 13; 2 SL: SWMU 23, 0.074	5 ppm	250 ppm	Eye, nose, and throat irritation; weakness; muscle ache; dark urine; dermatitis; convulsions	8.50
Potassium	SB: SWMU 16; 1,730 SL: SWMU 13; 19.1	NL	NL	No information found in the NIOSH pocket guide	NL
Pyrene	SB: SWMU 13; 0.8	0.2 mg/m^3	NL	Irritation	NL
RDX	SB: SWMU 13; 0.9	NL	NL	No information found in the NIOSH pocket guide	NL
Selenium	SB: SWMU 13; 3.5	0.2 mg/m^3	1 mg/m^3	Eye, nose, and throat irritation; visual disturbance; headache; chills; metallic taste; garlic breath; dermatitis	NL
Silver	SL: SWMU 12; 1.6	0.01 mg/m^3	10 mg/m^3	Blue-gray eyes; nasal septum, throat, skin, and GI irritation	NL
Sodium	SL: SWMU 13; 66 SS: SWMU 13; 1,010	NL	NL	No information found in the NIOSH pocket guide	NL
Thallium	SB: SWMU 13; 2.2	0.1 mg/m^3	15 mg/m^3	Nausea, diarrhea, abdominal pain, vomiting, chest pain	NL
Toluene	SL: SWMU 44; 0.016	50 ppm	500 ppm	Fatigue, weakness, confusion, dizziness, headache, dilated pupils, muscle fatigue, dermatitis	8.82

3.8 KNOWN CONTAMINANTS OF CONCERN

Contaminant	Location and Highest Concentration	PEL, REL, or TLV[a]	IDLH[b]	Symptoms and Effects of Exposure	PIP[c] eV
Trichloroethene	SB: SWMU 13; 2,700	25 ppm Ca	100 ppm	Headache, vertigo, visual disturbance, tremors, nausea, eye irritation, dermatitis	9.45
Vanadium	SB: SWMU 16; 89 SL: SWMU 13; 0.013	0.05 mg/m^3	35 mg/m^3	Eye and skin irritation, green tongue, metallic taste, coughing, wheezing	NL
Zinc	SL: SWMU 12; 110 SB: SWMU 13; 440	NL	NL	Skin and pulmonary system irritation	NL

Note a: Lowest numerical value listed
Note b: IDLH = Immediately Dangerous to Life and Health
Note c: PIP = Photoionization Potential
Note d: Ca = Carcinogen
Note e: NL = No Limit applicable/established/known
Note f: NIOSH = National Institute for Occupational Safety and Health
Note g: C = Ceiling

3.9 POTENTIAL ROUTES OF EXPOSURE

DERMAL: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.	**INHALATION:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in sections 5 and 6, respectively.	**OTHER:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

4 PERSONNEL

4.1 CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING

(Reference CH2M HILL SOP HS-01, *Medical Surveillance*, and HS-02, *Health and Safety Training*)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have received 8 hours of supervisor and instrument training and can serve as site safety coordinator (SSC) for the level of protection indicated. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including
obtaining a physician's statement of the employee's ability to perform hazardous activities, before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Claudia Cornejo	SJC	SSC/Team Leader	Level (D) SSC; FA-CPR
David Kinney	SFO	Field Member	Level (D) SSC; FA-CPR
Marty Medina	SFO	Field Member/SSC Team Leader Backup	Level (C) SSC; FA-CPR
Winifred Au	SFO	Field Member	FA-CPR
Mike Burkhardt	SJC	Field Member	Level (C) SSC; FA-CPR

4.2 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES

4.2.1 CLIENT

Contact: Name: Pete Zucca, Project Manager
Phone: 510/302-4257
Facility Contact Name: Richard Pieper
Phone: 510/246-5650

4.2.2 CH2M HILL

Project Manager: Winifred Au/SFO
Health and Safety Manager: Lisa Martin/SCO
Field Team Leader: Claudia Cornejo/SJC
Field Team Leader Backup: Marty Medina/SFO
Site Safety Coordinator: Claudia Cornejo/SJC
Site Safety Coordinator Backup: Marty Medina/SFO

The SSC is responsible for contacting the field team leader and the project manager. In general, the project manager either will contact or will identify the client contact. The Health and Safety Manager (HSM) should be contacted as appropriate. The SSC or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by OSHA or other agencies are conducted. Refer to sections 10 through 12 for emergency procedures and phone numbers.

4.2.3 SUBCONTRACTORS

(Reference Section 3, *Corporate Health and Safety Program Manual*)

When specified in the project documents (e.g., contract), this plan may cover CH2M HILL subcontractors. However, this plan does not address hazards associated with tasks and equipment that the subcontractor has expertise in (e.g., operation of drill rig). Specialty subcontractors are responsible for health and safety procedures and plans specific to their work. Specialty subcontractors are to submit plans to CH2M HILL for review and approval before the start of fieldwork. Subcontractors must comply with the established health and safety plan(s). CH2M HILL must monitor and enforce compliance with the established plan(s).

Subcontractor: Not Applicable

General health and safety communication with subcontractors contracted with CH2M HILL and covered by this plan is to be conducted as follows:

- Request that the subcontractor, if a specialty subcontractor, submit a safety or health plan applicable to their expertise (e.g., drill-rig safety plan or nuclear density gauge [NDG] health plan); attach the reviewed plan.
- Supply subcontractors with a copy of this plan, and brief them on its provisions.
- Direct health and safety communication to the subcontractor-designated safety representative.
- Notify the subcontractor-designated representative if a violation of the plan(s) is observed. Specialty subcontractors are responsible for mitigating hazards in which they have expertise.
- If a hazard condition persists, inform the subcontractor. If the hazard is not mitigated, stop affected work as a last resort and notify the project manager.
- When an apparent imminent danger exists, promptly remove all affected personnel. Notify the project manager.
- Make clear that consistent violations of the health and safety plan by a subcontractor may result in termination of the subcontract.

4.2.4 CONTRACTORS/CLIENT PERSONNEL

(Reference Section 3, *Corporate Health and Safety Program Manual*)

This plan does not cover client personnel or contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for directing client/contractor personnel and is not to assume responsibility through their actions. When the client/contractor is in control of the site, ask the client/contractor to conduct a briefing of their health and safety practices and to describe how they apply to CH2M HILL's activities. Request a copy of the client/contractor health and safety plan.

Contractor: Not applicable
Client: Navy personnel will be performing general heavy equipment work (e.g. excavation, grading of pavement, etc.)
Contact Name: Harold Kailhiwa, Foreman, Navy Public Works Center
Telephone: 510/231-8395

General health and safety communication with client personnel and/or contractor personnel *not* contracted with CH2M HILL is listed below.

- Ask the client/contractor to brief CH2M HILL on the client's/contractor's health and safety plan for how the plan affects CH2M HILL employees on the site.
- If acceptable to the client, communicate about health and safety directly with the contractor PM or other on-site client/contractor designated representative. CH2M HILL employees are not to direct the details of the client's/contractor's work or to advise on health and safety (e.g., how the client/contractor corrects unsafe conditions).
- If an observed hazard poses a risk to CH2M HILL personnel, notify the party controlling the work activity as soon as possible. Notify the project manager; the project manager will notify the client. Document oral notification in project records (i.e., the field logbook).
- If a hazardous condition endangering a CH2M HILL employee persists, inform the client/contractor and the project manager (the project manager will contact the client) that CH2M HILL cannot execute the assigned work until the hazard is mitigated.
- When an apparent imminent danger exists, orally warn the person(s) in danger and orally notify the client/contractor promptly. When an imminent danger involves a CH2M HILL employee, remove the employee and suspend CH2M HILL work immediately until the hazard has been mitigated. Inform the project manager and the client/contractor promptly.
- The SSC or the project manager must notify the client and CH2M HILL health and safety staff when (1) the client/contractor fails to remedy an unsafe condition affecting CH2M HILL personnel, (2) the client/contractor does not remedy the hazardous condition within a reasonable period of time, or (3) the client/contractor repeatedly creates the hazardous condition.

5 PERSONAL PROTECTIVE EQUIPMENT (PPE) (Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*, Section 2 of the *Site Safety Notebook*)

5.1 PPE SPECIFICATIONS[a]

Task	Level	Body	Head	Respirator[b]
General work uniform when no chemical exposure is anticipated	D	Work clothes; steel-toe, steel-shank leather work boots; work gloves	Hardhat[c] Safety glasses Ear protection[d]	None required
All tasks	Modified D	**COVERALLS:** Uncoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Safety glasses Ear protection[d]	None required (Respirator optional for Septic Tank Sampling and pump out. If Action Levels in Table 6 are exceeded, respirator mandatory; see next row)
Observation of opening of septic tanks, and all tasks if action levels in Table 6 are exceeded.	C	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H[e] cartridges or equivalent
NOT APPROVED	B	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA): MSA Ultralite, or equivalent

[a] Modifications are as indicated. CH2M HILL will provide PPE to only CH2M HILL employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to determined by the SSC.
[d] Ear protection should be worn while working around drill rigs or other noise-producing equipment or when conversations cannot be held at distances of 3 feet or less without shouting. Refer to Section 6 for other requirements.
[e] The GME-H cartridge is the new standard-issue cartridge. Available stock of the previously standard GMC-H cartridges may be used for tasks covered by this plan.

5.2 REASONS FOR UPGRADING OR DOWNGRADING LEVEL OF PROTECTION

Upgrade*	Downgrade
• Request from individual performing task. • Change in work task that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 6) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

*Performing a task that requires an upgrade to a higher level of protection (e.g., level D to level C) is permitted only when the PPE requirements have been specified in Section 5 and an SSC who meets the requirements specified in subsection 4.1 is present.

6 AIR MONITORING SPECIFICATIONS (Reference CH2M HILL SOP HS-06, *Air Monitoring*, and Section 2 of the *Site Safety Notebook*)

Instrument	Tasks	Action Levels[a]		Frequency[b]	Calibration
FID/PID: TVA-1000	All tasks	0-1 ppm >1 ppm	Level D Stop work; ventilate and reevaluate	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent	Observation of opening of septic tanks	0-10%[c] LEL: 10-25%[c] LEL: >25%[c] LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
O_2 Meter: MSA model 260 or 261 or equivalent	Observation of opening of septic tanks	>25.0%[c] O_2: 20.9%[c] O_2: <19.5%[c] O_2:	Explosion hazard; evacuate or vent Normal O_2 O_2 deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily
Dust Monitor: Miniram model PDM-3 or equivalent	Tasks that generate visible dust in the employee breathing zone	0 - 0.5 mg/m^3 0.5 - 2 mg/m^3 >2 mg/m^3	Level D Level C (if no other action levels exceeded) Stop work; reevaluate	Initially and periodically during task	Zero Daily

Note a: Action levels apply to above background measurements, sustained in the breathing zone for >5 minutes.

Note b: The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes is acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time and measurement result, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3," "at surface/SB-2," etc.).

Note c: If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply to only ambient working atmospheres, and do not apply to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry; refer to Section 9.

6.1 CALIBRATION SPECIFICATIONS

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: TVA 1000	100 ppm isobutylene	CF=0.55	55 ppm ± 5 ppm	1.5 lpm REG T-Tubing
FID: TVA 1000	100 ppm methane	CF=1.00	100 ppm ± 10	1.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m^3 in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5 % LEL	1.5 lpm reg direct tubing

6.2 AIR SAMPLING

Sampling may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description: Not applicable

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: Lisa Martin/SCO

7 DECONTAMINATION (REFERENCE CH2M HILL SOP HS-13, *DECONTAMINATION*)

The SSC must monitor the effectiveness of the decontamination procedures. Decontamination procedures found to be ineffective will be modified by the SSC.

7.1 DECONTAMINATION SPECIFICATIONS

Personnel

- Boot wash/rinse
- Glove wash/rinse
- Outer-glove removal
- Body-suit removal
- Inner-glove removal
- Respirator removal
- Hand wash/rinse
- Face wash/rinse
- Shower ASAP
- **PPE-disposal method:** Dispose at Naval Weapons Station by NWS personnel.
- **Water-disposal method:** Temporarily stored at Navy PWC's water tank. Disposed at the Central Contra Costa Sanitary District, as permitted.

Sample Equipment

- Wash/rinse equipment
- Solvent-rinse equipment
- **Solvent-disposal method:** Temporarily stored at Navy PWC's water tank. Disposed at the Central Contra Costa Sanitary District, as permitted.

Heavy Equipment

- Power wash
- Steam clean
- **Water-disposal method:** Temporarily stored at Navy PWC's water tank. Disposed at the Central Contra Costa Sanitary District, as permitted.

7.2 DIAGRAM OF PERSONNEL-DECONTAMINATION LINE

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a typical establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

8 SPILL-CONTAINMENT PROCEDURES

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and will be disposed of properly.

9 CONFINED-SPACE ENTRY

(Reference CH2M HILL SOP HS-17, *Confined Space Entry*)

No confined-space entry will be permitted. Confined-space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.

When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and informed of their hazards.

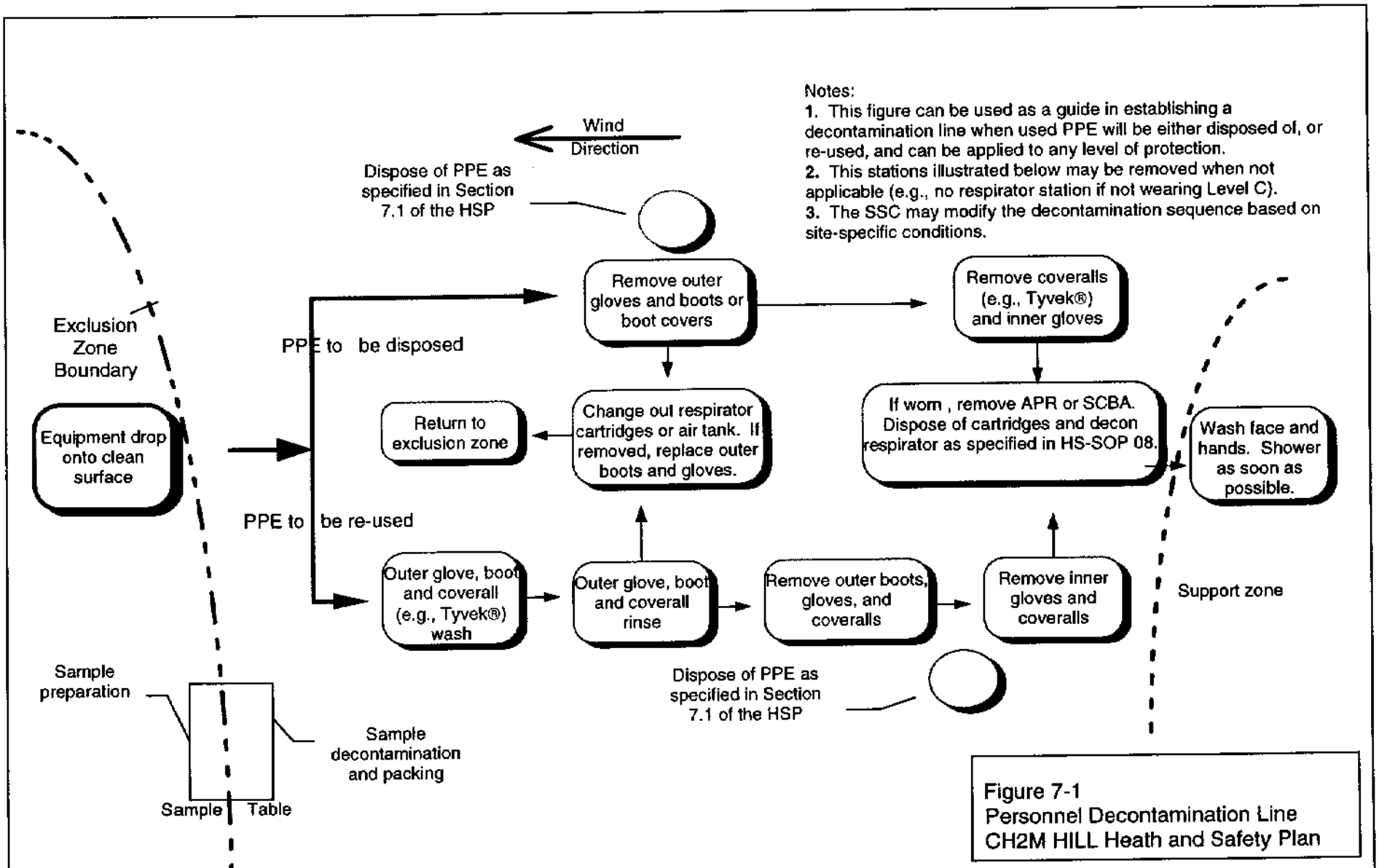

Figure 7-1
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

10 SITE-CONTROL PLAN

10.1 SITE-CONTROL PROCEDURES

- The site safety coordinator (SSC) will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of health and safety plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies. Refer to Section 8 of *Site Safety Notebook.*
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location at sites where project field offices, trailers, or equipment storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones. Delineate work zones with flags or cones as appropriate. Support zone should be upwind of the site.
- Establish decontamination procedures, including respirator-decontamination procedures, and test the procedures.
- Use access control at the entry and exit from each work zone.
- Store chemicals in appropriate containers.
- Make MSDSs available for on-site chemicals to which employees are exposed.
- Establish on-site communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish off-site communication.
- Establish and maintain the "buddy system."
- Establish procedures for disposing of material generated on the site.
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SSC is to conduct periodic inspections of work practices to determine the effectiveness of this plan -- refer to CH2M HILL SOP 18, *Health and Safety* Checklist, or Section 4 of *Site Safety Notebook.* Deficiencies are to be noted, reported to the HSM, and corrected.

10.2 HAZWOPER COMPLIANCE PLAN (Reference CH2M HILL SOP HS-17, *Health and Safety Plans*)

This section outlines procedures to be followed when certain activities do not require 24- or 40-hour training. ***Note, prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.***

- Certain parts of the site work may be covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated tasks must be included in subsection 2.2.1.
- Air sampling must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 3.8 and 6.2 for contaminant data and air sampling requirements, respectively.
- Non-Hazwoper-trained personnel must be informed of the nature of the existing contamination and its locations, the limits of their access, and the emergency action plan for the site. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements, including 29 CFR 1910.1200 (HAZCOM). Refer to subsection 3.7.1 for hazard communication requirements.
- Air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to volatile contaminants. Non-Hazwoper-trained personnel should be monitored whenever the belief is that there may be a possibility of exposure (e.g., change in site conditions), or at some reasonable frequency to confirm that there is no exposure. Refer to Section 6.1 for air monitoring requirements.
- Treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must leave the site.

If Hazwoper-regulated tasks are conducted concurrently with nonregulated tasks, non-Hazwoper-trained subcontractors must be removed from areas of exposure. If non-Hazwoper-trained personnel remain on the site while a Hazwoper-regulated task is conducted, the contaminant/exposure area (exclusion zone) must be posted, non-Hazwoper-trained personnel must be reminded of the locations of restricted areas and the limits of their access, and real-time monitoring must be conducted. Non-Hazwoper-trained personnel at risk of exposure must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

11 EMERGENCY RESPONSE PLAN (REFERENCE CH2M HILL SOP HS-12, *EMERGENCY RESPONSE*)

11.1 PRE-EMERGENCY PLANNING

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Locate the nearest telephone; determine what on-site communication equipment is available (e.g., two-way radio, air horn).
- Identify and communicate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to on-site personnel.
- Post site map marked with locations of emergency equipment and supplies, and post OSHA job-site poster. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, on-site operations, and personnel availability in relation to emergency response procedures.
- Evaluate capabilities of local response teams where applicable.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases.
- Review notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin, including driving the route to the hospital.
- Brief new workers on the emergency response plan.
- The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

11.2 EMERGENCY EQUIPMENT AND SUPPLIES

The SSC should mark the locations of emergency equipment on the site map and should post the map.

Emergency Equipment and Supplies	Location
20 lb (or two 10-lb) fire extinguisher (A, B, and C classes)	Claudia Cornejo/SSC's Vehicle
First aid kit	Claudia Cornejo/SSC's Vehicle
Eye wash	Claudia Cornejo/SSC's Vehicle
Potable water	Claudia Cornejo/SSC's Vehicle
Blood-borne-pathogen kit	Claudia Cornejo/SSC's Vehicle
Cellular phone	Claudia Cornejo/SSC's Vehicle

11.3 EMERGENCY MEDICAL TREATMENT

- Notify appropriate emergency response authorities listed in sections 12 and 13 (e.g., 911).
- During a time of no emergency, contact CH2M HILL's medical consultant for advice and guidance on medical treatment.
- The SSC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Notify the field team leader and the project manager of the injury.
- Make certain that the injured person is accompanied to the emergency room.
- Notify the health and safety manager.
- Notify the injured person's human resources department within 24 hours.
- Prepare an incident report -- refer to CH2M HILL SOP 12, *Emergency Response and First Aid*, and Section 6 of *Site Safety Notebook*. Submit the report to the corporate director of health and safety and the corporate human resources department (COR) within 48 hours.
- When contacting the medical consultant, state that you are calling about a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.

11.4 NON-EMERGENCY PROCEDURES

The procedures listed above may be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant.

- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Follow these procedures as appropriate.

11.5 INCIDENT RESPONSE

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Notify appropriate response personnel.
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

11.6 EVACUATION

- Evacuation routes will be designated by the SSC before work begins.
- On-site and off-site assembly points will be designated before work begins.
- Personnel will leave the exclusion zone and assemble at the on-site assembly point upon hearing the emergency signal for evacuation.
- Personnel will assemble at the off-site point upon hearing the emergency signal for a site evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- The SSC accounts for all personnel in the on-site assembly zone.
- A person designated by the SSC before work begins will account for personnel at the off-site assembly area.
- The SSC will write up the incident as soon as possible after it occurs and will submit a report to the corporate director of health and safety.

11.7 EVACUATION ROUTES AND ASSEMBLY POINTS

Refer to the site map in Section 1. Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.

11.8 EVACUATION SIGNALS

Signal	Meaning
Grasping throat with hand	Emergency–help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

12 EMERGENCY RESPONSE

12.1 EMERGENCY RESPONSE TELEPHONE NUMBERS

SITE ADDRESS: Code 09203 - Port Chicago Hwy.,
Concord, CA 94520-5000

Police: Concord Police	**Phone:** 9-911 (from onsite phones)*
Fire: Concord Fire Department	**Phone:** 9-911 (from onsite phones)*
Ambulance: Mount Diablo Medical Center	**Phone:** 9-911 (from onsite phones)*
Water: Contra Costa Water District or Emergency PWC or Chris Copinger	**Phone:** 510/246-5867 or 510/302-6171 or 510/246-2226
Gas: Emergency PWC or Chris Copinger	**Phone:** 510/302-6171 or 510/246-2226
Electric: Emergency PWC or Chris Copinger	**Phone:** 510/302-6171 or 510/246-2226
Base Security - Emergency Dispatcher	**Phone:** 510/246-5553
Site Manager: Chuck Schimbre (during working hours)	**Phone:** 501/246-5681

*When using a cellular phone outside the telephone's normal calling area, exercise caution in relying on the cellular phone to activate 911. When the caller is outside the normal calling area, the cellular service carrier should connect the caller with emergency services in the area where the call originated, but this may not occur. Telephone numbers of backup emergency services should be provided if a cellular phone is relied on to activate 911.

Hospital: Mount Diablo Medical Center Address: 2540 East St. P.O. Box 4110 Concord, CA 94520	Phone: 510/674-2333
Base Hospital (non-emergency, hours: 7 a.m.-4 p.m.)	Phone: 510/246-5867

Route to Hospital: (Refer to Figure 2)

SWMUs 12, 13, 14, 16, 17, 20, 24:
Take Kinne Blvd. (heading northwest)
Turn left on Port Chicago Hwy. (heading south)
Pass Olivera Rd
Turn right on School Ave (heading west)
Turn left on East St. (heading south)
Hospital is immediately on left hand side

SWMU 23:
Take left Inchon Dr. (heading northwest)
Turn left on L St. (heading south)
Turn right on Kinne Blvd. (heading northwest)
Turn right on Port Chicago Hwy. (heading south)
Pass Olivera Rd
Turn right on School Ave (heading west)
Turn left on East St. (heading south)
Hospital is immediately on left hand side

SWMU 40 and 44:
Exit Tidal Area
Turn right on Port Chicago Hwy. (heading south)
Pass Olivera Rd
Turn right on School Ave (heading west)
Turn left on East St. (heading south)
Hospital is immediately on left hand side

12.2 GOVERNMENT AGENCIES INVOLVED IN PROJECT

Federal Agency and Contact Name: U.S. Environmental Protection Agency, Region 9, Barbara Smith
Phone: 415/744-2366

State Agency and Contact Name: Department of Toxic Substances Control, Jim Pinasco
Phone: 916/225-3719

Local Agency and contact Name: Regional Water Control Board, Susan Gladstone
Phone: 510/286-0840

Contact the project manager. Generally, the project manager will contact relevant government agencies.

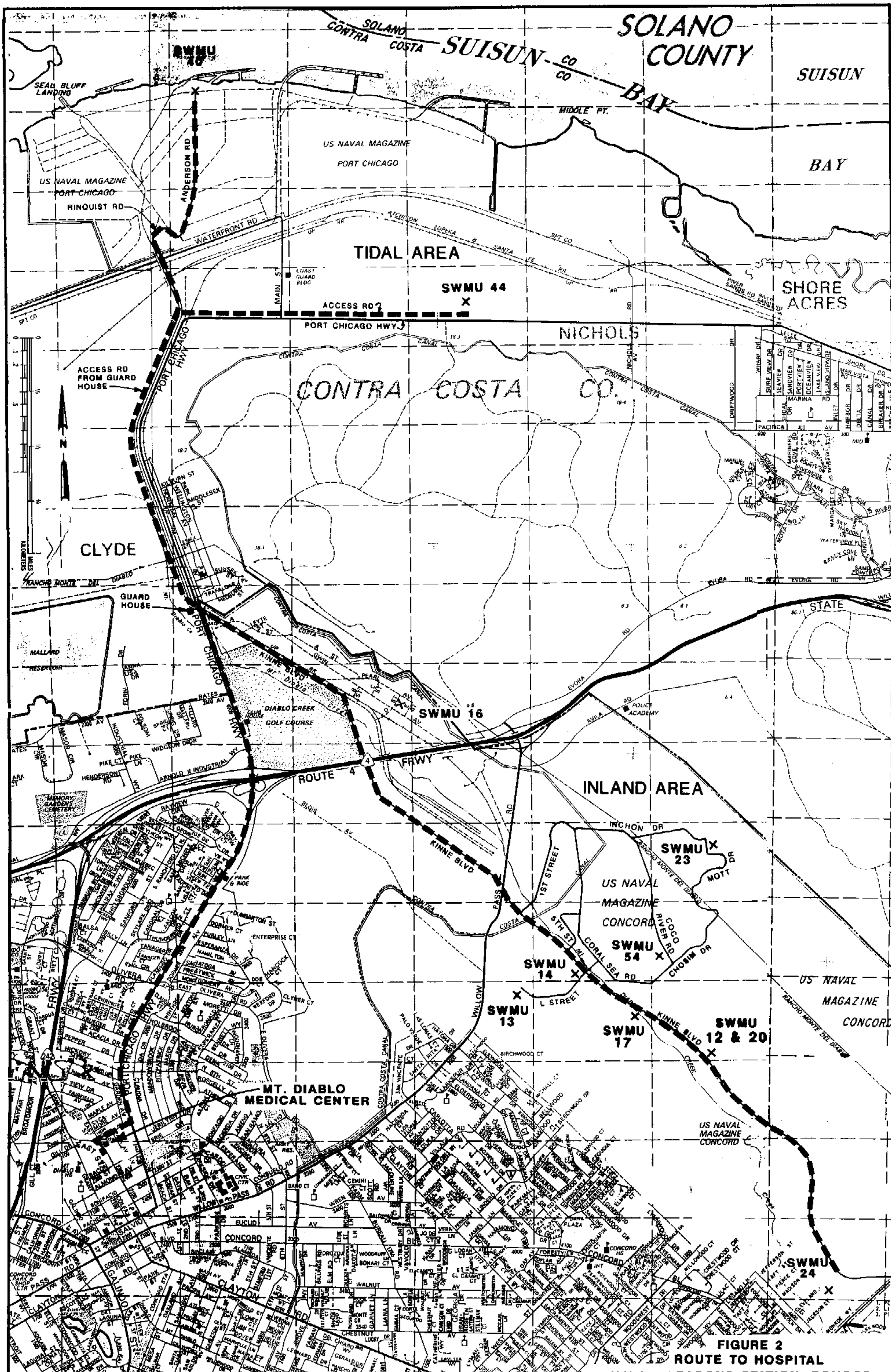

FIGURE 2
ROUTE TO HOSPITAL
NAVAL WEAPONS STATION, CONCORD
CH2M HILL

130175.03.WP

13 EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury.

CH2M HILL Medical Consultant

Dr. Elayne F. Theriault
Environmental Medical Resources, Inc.
Atlanta, Georgia
800/229-3674 OR 770/455-0818
(After-hours calls will be returned within 20 minutes.)

Occupational Physician (Local)

Barbara Snyder

Amhealth Medical Group of California

384 Embarcadero West

Oakland , CA 94604

510/465-9565

Corporate Director Health and Safety

Name: Mollie Netherland/SEA
Phone: 206/453-5005 x5342

Site Safety Coordinator (SSC)

Name: Claudia Cornejo/SJC
Phone:(408)436-4936 x249

Medical and Training Administrator

Name:Susan Robinson/COR
Phone: 303/771-0900

Regional Manager

Name: Stan Smith/SAC
Phone: 916/920-0212 x210

Health and Safety Manager (HSM)

Name: Lisa Martin/SCO
Phone: 714/250-0555 x2164

Project Manager

Name: Winifred Au/SFO
Phone: 510/251-2426 x2170

Radiation Health Manager (RHM)

Name:Frank Petelka/ORO
Phone: 615/483-9032 (H) 615/482-8667

Regional Human Resources Department

Name: Jim Powell/SAC
Phone: 916/920-0212 x221

Client

Name: Pete Zucca
Phone: 510/302-4257

Corporate Human Resources Department

Name:Julie Zimmerman/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping

Phone: 800/238-5355

CH2M HILL Emergency Number for Shipping Dangerous Goods

Phone: 800/255-3924

Worker's Compensation and Auto Claims

GAB Business Services, Inc.
Phone: 800/747-7222 After hours 800/621-5410

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

14 APPROVAL

This site-specific health and safety plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

14.1 ORIGINAL PLAN

WRITTEN BY: Claudia Cornejo/SJC **DATE:** July 24, 1996

APPROVED BY: Lisa Martin/SCO **DATE:** 7-31-96

Lisa Martin, CIH

14.2 REVISIONS

REVISIONS MADE BY: **DATE:**

REVISIONS TO PLAN:

REVISIONS APPROVED BY: **DATE:**

15 DISTRIBUTION

Name	Office	Responsibility	Number of Copies
Jerri McCauslin	COR	Senior Program Assistant	1
Lisa Martin	SCO	Health and Safety Manager/Approver	1
Winifred Au/SFO	SFO	Project Manager	1
Claudia Cornejo	SJC	Field Team Leader/SSC	1
Client, Pete Zucca	NA	Client Project manager	1

16 ATTACHMENTS

Attachment 1: Employee Sign-off
Attachment 2: Applicable Material Safety Data Sheets

Attachment 1
Employee Sign-off

EMPLOYEE SIGN-OFF

The employees listed below have been given a copy of this health and safety plan, have read and understood it, and agree to abide by its provisions.

EMPLOYEE NAME	EMPLOYEE SIGNATURE AND DATE
Claudia Cornejo/SJC	
David Kinney/SFO	
Winifred Au/SFO	
Marty Medina/SFO	
Mike Burkhardt/SJC	

Attachment 2
Material Safety Data Sheets

AIRCO

Material Safety Data Sheet METHANE IN AIR 0.0001% TO 2.5%	Page: 1 Rev. Date 08/09/89

Airco, Division of The BOC Group, Inc. Telephone: (201)464-8100
575 Mountain Avenue
Murray Hill, NJ 07974

Emergency Contact: CHEMTREC
Emergency Phone Number: (800)424-9300

SECTION #1 - IDENTIFICATION

Product: METHANE IN AIR 0.0001% TO 2.5%

CAS Number: Not Established
Product Code: MSDS CODE G-149
Chemical Family: Gas Mixture
Chemical Formula: CH4 in AIR

Synonyms: G-149

SECTION #2 - CHEMICAL COMPONENTS

Component: AIR
CAS Number: Not Established Percent of Mixture: 97.5000 to 99.9999

Component: METHANE
CAS Number: 74-82-8 Percent of Mixture: 0.0001 to 2.5000
Simple Asphyxiant - maintain oxygen levels above 19.5 percent

SECTION #3 - PHYSICAL DATA

Solubility (H2O): Negligible

Appearance

A colorless gas

Odor

Odorless gas

SECTION #4 - FIRE FIGHTING & EXPLOSION DATA

Flash Point: Gas°F

Lower Explosive Limit (%): 5 (CH_4)
Upper Explosive Limit (%): 15 (CH_4)

Fire and Explosion Hazards

Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable mixture formation in low areas or pockets.

Extinguishing Media

Water, Carbon dioxide, Dry chemical

Special Fire Fighting Instructions

If possible, stop the flow of gas mixture. Use water spray to cool surrounding containers.

SECTION #5 - EXPOSURE and EFFECTS - INHALATION

Routes of Exposure - Inhalation

Methane is a simple asphyxiant. Oxygen levels should be maintained at greater than 19.5 percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg.

High concentrations of this gas mixture so as to exclude an adequate supply of oxygen to the lungs causes dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

Methane in Air is relatively inactive biologically and essentially nontoxic; therefore, the major hazard is the exclusion of an adequate supply of oxygen to the lungs.

First Aid - Inhalation

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, and if breathing has stopped, administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

SECTION #5 - EXPOSURE and EFFECTS - EYES

Routes of Exposure - Eyes

Contact with liquid may cause tissue freezing.

First Aid - Eyes

Never introduce ointment or oil into the eyes without medical advice! In case of freezing or cryogenic "burns" caused by rapidly evaporating liquid, DO NOT WASH THE EYES WITH HOT OR EVEN TEPID WATER! Remove victim from the source of contamination. Open eyelids wide to allow liquid to evaporate. If pain is present, refer the victim to an ophthalmologist for treatment and follow up. If the victim cannot tolerate light, protect the eyes with a light bandage.

SECTION #5 - MISCELLANEOUS TOXICOLOGICAL INFORMATION

Carcinogenicity -- NTP: No IARC: No OSHA: No

SECTION #6 - REACTIVITY & POLYMERIZATION

Stability: Stable

Incompatible Materials

Oxidizers

SECTION #7 - SPILL, LEAK, & DISPOSAL PROCEDURES

Steps to be Taken in The Event of Spills, Leaks, or Release

Evacuate all personnel from affected area. Use appropriate protective equipment. If a leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact CHEMTREC for emergency assistance or your closest Airco location.

Waste Disposal Methods

Do not attempt to dispose of waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURE AND VALVE PROTECTION CAP IN PLACE to Airco for proper disposal.

SECTION #7 - SPILL, LEAK, & DISPOSAL PROCEDURES Continued...

SARA Hazard Classes: Sudden Release of Pressure Hazard

SECTION #8 - SPECIAL PROTECTIVE MEASURES

Ventilation

Hood with forced ventilation.

Local exhaust to prevent accumulation above the exposure limit.

Mechanical in accordance with electrical codes.

Eye Protection

Safety goggles or glasses.

Skin Protection

Plastic or rubber gloves

Respiratory Protection

ositive pressure air line with mask or self-contained breathing apparatus hould be available for emergency use.

Other Protection

Safety shoes, safety shower.

SECTION #9 - SPECIAL PRECAUTIONS - STORAGE & HANDLING

Storage & Handling Conditions

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to

SECTION #9 - SPECIAL PRECAUTIONS - STORAGE & HANDLING Continued...

Storage & Handling Conditions

exceed 130°F. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association Pamphlets P-1, P-9, P-14, and safety bulletin SB-2.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

SECTION #10 - SHIPPING INFORMATION

Proper Shipping Name: Compressed Gas NOS

Hazard Class: Non-flammable Gas
DOT Identification Number: UN1956
DOT Shipping Label: Non-flammable Gas

SECTION #11 - MISC COMMENTS & REFERENCE DOCUMENTATION

Methane and Air are non-corrosive and may be used with any common structural material.

Earth-ground and bond all lines and equipment associated with the product system. Electrical equipment should be non parking or explosion-proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipments of a compressed gas cylinder, which has not been filled by the owner or with his (written) consent, is a violation of Federal Law (49CFR).

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained therein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

AIR PRODUCTS

BYRNE SPECIALTY GASES

Byrne Specialty Gases, Inc.
514 S. River Street
Seattle, Washington 98108 (206) 764-4633

Specialty Gas Material Safety Data Sheet

EMERGENCY PHONE (800) 523-9374 IN PENNSYLVANIA (800) 322-9092	PRODUCT NAME ISOBUTYLENE	CAS #115-11-7
AIR PRODUCTS AND CHEMICALS, INC. BOX 538 ALLENTOWN, PA 18105 (215) 481-8257	TRADE NAME AND SYNONYMS Isobutylene	
	CHEMICAL NAME AND SYNONYMS Isobutylene, Isobutene, 2-Methylpropene	
ISSUE DATE AND REVISIONS 04/78, 06/85	FORMULA (iso) C_4H_8	CHEMICAL FAMILY Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

See last page.

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations which exclude an adequate supply of oxygen to the lungs cause dizziness, drowsiness and eventual unconsciousness. It also has a very mild anesthetic effect which might cause lack of coordination or lessened mental alertness.

Skin and Eye Contact: It is mildly irritating to mucous membranes. Due to its rapid rate of evaporation, isobutylene can cause tissue freezing or frostbite on contact.

TOXICOLOGICAL PROPERTIES

Isobutylene has a very mild anesthetic effect, however, the major health hazard is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS REQUIRED IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND MUST BE AWARE OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Move exposed personnel to an uncontaminated area. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Medical assistance should be sought immediately.

Skin Contact or Frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has caused blistering of the skin or deep tissue freezing.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES
Isobutylene is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT 19.6°F (−6.9°C)	**LIQUID DENSITY AT BOILING POINT** 39.1 lb/ft³ (626 kg/m³)
VAPOR PRESSURE @ 70°F (21.1°C) = 39 psia (269 kPa)	**GAS DENSITY AT 70°F, 1 atm** 0.148 lb/ft³ (2.37 kg/m³)
SOLUBILITY IN WATER Insoluble	**FREEZING POINT** −220.6°F (−140.3°C)
APPEARANCE AND ODOR Colorless gas with an unpleasant odor similar to that which is emitted when burning anthracite coal.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) See last page.	**AUTO IGNITION TEMPERATURE** 869°F (465°C)	**FLAMMABLE LIMITS % BY VOLUME** LEL 1.8 UEL 9.6
EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical		**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES
Keep cylinder(s) cool with water spray from a distance. If possible without risk, move cylinder(s) away from fire area. If possible without risk, stop the flow of gas to a fire. Allow gas fire to burn itself out. (Continued on last page.)

UNUSUAL FIRE AND EXPLOSION HAZARDS
Isobutylene is denser than air and can travel considerable distances to an ignition source and flash back. Cylinder(s) may explode or vent when exposed to fire.

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	

INCOMPATIBILITY (Materials to avoid)
Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, call the "800" emergency phone number listed herein.

WASTE DISPOSAL METHOD
All Federal, State and Local regulations regarding health and pollution should be followed in waste disposal. Contact Air Products for specific recommendations. Do not dispose of unused quantities.

(Continued on last page.)

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation	To prevent accumulation above the LEL	
	MECHANICAL (Gen.) In accordance with electrical codes	OTHER

PROTECTIVE GLOVES
Plastic or rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower, eyewash "fountain."

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Liquified petroleum gas DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas ID No.: UN 1075

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (< 250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional recommendations consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional recommendations consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Isobutylene is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the isobutylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

Specialty Gas Department
Air Products and Chemicals, Inc.
Box 538, Allentown, PA 18105
(215) 481-8257

AIR PRODUCTS

TIME WEIGHTED AVERAGE EXPOSURE LIMIT (Continued)

Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH 1984–85)

FLASH POINT (Method Used) (Continued)

− 105°F (− 76°C) Closed Cup

SPECIAL FIRE FIGHTING PROCEDURES (Continued)

Ventilate low areas where flammable or explosive mixtures may form.

WASTE DISPOSAL METHOD (Continued)

Return the properly labeled shipping container to Air Products for disposal with valve(s) tightly closed, outlet seal(s) secured and valve protection cap in place. For emergency disposal assistance, call the "800" emergency phone number listed herein.

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ALPHAGAZ

Specialty Gas

Material Safety Data Sheet

	PRODUCT NAME: Pentane	
	TELEPHONE (415) 977-6500 EMERGENCY RESPONSE INFORMATION ON PAGE 2	
LIQUID AIR CORPORATION ALPHAGAZ DIVISION California Plaza, Suite 350 2121 N. California Blvd. Walnut Creek, California 94596	TRADE NAME AND SYNONYMS: Pentane; n-Pentane	CAS NUMBER: 109-66-0
	CHEMICAL NAME AND SYNONYMS: Pentane; n-Pentane	NFPA 704 NUMBER (HMIS): 0 4 0
ISSUE DATE AND REVISIONS: AUGUST 1, 1987 CORPORATE SAFETY DEPT.	FORMULA: C_5H_{12} MOLECULAR WEIGHT: 72.15	CHEMICAL FAMILY: Alkane

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

600 Molar PPM; STEL = 750 Molar PPM (ACGIH 1986-87). OSHA (1985)TWA = 1,000 Molar PPM.

SYMPTOMS OF EXPOSURE Vapors may cause mild irritation of the eyes, skin or lungs.

Inhalation: High concentrations of pentane so as to exclude an adequate supply of oxygen to the lungs causes dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

Contact with rapidly evaporating liquid can cause cryogenic "burns" or frostbite.

TOXICOLOGICAL PROPERTIES

Pentane is inactive biologically and essentially nontoxic; therefore, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white, possibly followed by blistering.

Pentane is not listed in the IARC, NTP or by OSHA as a carcinogen or a potential carcinogen.

Listed as Carcinogen or Potential Carcinogen	National Toxicology Program	I.A.R.C. Monographs	OSHA
	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PENTANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

Dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

entane is flammable in air.

PHYSICAL DATA

BOILING POINT 97°F (36°C)	**LIQUID DENSITY AT BOILING POINT** @ 60°F (15.5°C) = 39.3 lb/ft^3 (629.4 kg/m^3)
VAPOR PRESSURE @ 100°F (37.8°C) = 5 psia (103 kPa)	**GAS DENSITY AT 70°F 1 atm** @ 60°F (15.5°C) = .2015 lb/ft^3 (3.228 kg/m^3)
SOLUBILITY IN WATER Negligible	**FREEZING POINT** -201.5°F (-129.7°C)

APPEARANCE AND ODOR Colorless liquid and vapor with mild paraffinic odor.
Specific gravity (air=1) = 2.48

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) -40° F & C (C.C.)	**AUTO IGNITION TEMPERATURE** Unknown	**FLAMMABLE LIMITS % BY VOLUME** LEL = 1.4 UEL = 8.3

EXTINGUISHING MEDIA Water (foam), dry chemical, carbon dioxide

ELECTRICAL CLASSIFICATION Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES
If possible, stop flow of pentane. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None

REACTIVITY DATA

STABILITY Unstable		**CONDITIONS TO AVOID**
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)
Oxygen, other oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION May Occur		**CONDITIONS TO AVOID**
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest Liquid Air location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest Liquid Air location or call the emergency telephone number listed herein.

EMERGENCY RESPONSE INFORMATION
IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT (800) 231-1366
OR CALL CHEMTREC AT (800) 424-9300

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation	To prevent accumulation above the TWA.	N/A
	MECHANICAL (Gen.) In accordance with electrical codes	**OTHER** N/A

PROTECTIVE GLOVES
Plastic or rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower, eyewash "fountain"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Pentane
DOT Hazard Class: Flammable liquid
DOT Shipping Label: Flammable liquid
DOT I.D. No.: UN 1265

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<50 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not tamper with (valve) safety device. Close valve after each use and when empty.

For additional handling recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no source of ignition in the storage or use area.

For additional storage recommendations consult L'Air Liquide's Encyclopedia de Gaz or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Pentane is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the Pentane system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, (Continued on last page)

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which may not be contained herein. The customer or user of this product should be familiar with these regulations

LIQUID AIR CORPORATION
ALPHAGAZ DIVISION

ADDITIONAL DATA

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued) enclosed vans, truck c
or in passenger compartments. Transport cylinders secured in open flatbed t
open pick-up type vehicles.

J.T.BAKER INC. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865
M A T E R I A L S A F E T Y D A T A S H E E T
24-HOUR EMERGENCY TELEPHONE -- (908) 859-2151
CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

EFFECTIVE: 03/30/92 ISSUED: 07/02/92

J.T.BAKER INC., 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: HYDROCHLORIC ACID
COMMON SYNONYMS: MURIATIC ACID; CHLOROHYDRIC ACID; HYDROGEN CHLORIDE, AQUEOUS
CHEMICAL FAMILY: INORGANIC ACIDS
FORMULA: HCL
FORMULA WT.: 36.46
CAS NO.: 7647-01-0
NIOSH/RTECS NO.: MW4025000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 9538,9535,4800,9542,9534,9549,9529,9547,9546,6900,9536,9540 9539,9548,5367,9544,5800,5214,9543,9530,9537,5537,5814,5575

PRECAUTIONARY LABELING

AKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	2	MODERATE
CONTACT	-	3	SEVERE (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

CAUSES SEVERE BURNS. MAY BE FATAL IF SWALLOWED OR INHALED.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR. CAUSES DAMAGE TO RESPIRATORY SYSTEM (LUNGS), EYES AND SKIN. KEEP IN TIGHTLY CLOSED CONTAINER. LOOSEN CLOSURE CAUTIOUSLY. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF SPILL NEUTRALIZE WITH SODA ASH OR LIME AND PLACE IN DRY CONTAINER.

CONTINUED ON PAGE: 2

PRECAUTIONARY LABELING (CONTINUED)

INTERNATIONAL LABELING

IRRITATING TO EYES AND SKIN.
KEEP OUT OF REACH OF CHILDREN. IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.

SAF-T-DATA* STORAGE COLOR CODE: WHITE (CORROSIVE)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
HYDROCHLORIC ACID	7647-01-0	33-40	5 PPM	5 PPM
WATER	7732-18-5	60-67	N/E	N/E

SECTION III - PHYSICAL DATA

BOILING POINT: 149 C (300 F)
(AT 760 MM HG)

MELTING POINT: -25 C (-13 F)
(AT 76[illegible] MM HG)

SPECIFIC GRAVITY: 1.18
(H2O=1)

SOLUBILITY(H2O): COMPLETE (100%)

PH: 1.0 (0.1M SOLUTION)

ODOR THRESHOLD (P.P.M.): N/A

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

VAPOR PRESSURE (MMHG): N/A

VAPOR DENSITY (AIR=1): 1.3

EVAPORATION RATE: N/A

% VOLATILES BY VOLUME: 100
(21 C)

PHYSICAL STATE: LIQUID

APPEARANCE & ODOR: CLEAR, COLORLESS FUMING LIQUID. PUNGENT ODOR.

CONTINUED ON PAGE: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A NFPA 704M RATING: 3-0-0

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINQUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL. DO NOT GET WATER INSIDE CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS
MAY EMIT HYDROGEN GAS UPON CONTACT WITH METAL.

TOXIC GASES PRODUCED
HYDROGEN CHLORIDE, HYDROGEN

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 7 MG/M3 (5 PPM)

TLV (CEILING) IS FOR HYDROGEN CHLORIDE.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 7 MG/M3 (5 PPM)

PEL (CEILING) IS FOR HYDROGEN CHLORIDE.

CONTINUED ON PAGE: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

TOXICITY OF COMPONENTS

INTRAPERITONEAL MOUSE LD50 FOR HYDROCHLORIC ACID	40	MG/KG
ORAL RABBIT LD50 FOR HYDROCHLORIC ACID	900	MG/KG
INHALATION-1HR RAT LC50 FOR HYDROCHLORIC ACID	3124	PPM
INTRAPERITONEAL MOUSE LD50 FOR WATER	190	G/KG
INTRAVENOUS MOUSE LD50 FOR WATER	25	G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: PULMONARY EDEMA, CIRCULATORY FAILURE, RESPIRATORY SYSTEM DAMAGE, COLLAPSE, COUGHING, DIFFICULT BREATHING

SKIN CONTACT: SEVERE BURNS

EYE CONTACT: SEVERE BURNS

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: IS HARMFUL AND MAY BE FATAL. SEVERE BURNS TO MOUTH, THROAT, AND STOMACH, NAUSEA, VOMITING

CHRONIC EFFECTS: MAY CAUSE TEETH DAMAGE

TARGET ORGANS
RESPIRATORY SYSTEM, EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY
INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT

CONTINUED ON PAGE: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	YES	CONTAINS HYDROGEN CHLORIDE (RQ = 1 LB, TPQ = 500 LBS)
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS HYDROCHLORIC ACID (RQ = 5000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS HYDROCHLORIC ACID
GENERIC CLASS:		GENERIC CLASS REMOVED FROM CFR: 7/1/91
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, MOISTURE

INCOMPATIBLES: MOST COMMON METALS, WATER, AMINES, METAL OXIDES, ACETIC ANHYDRIDE, PROPIOLACTONE, VINYL ACETATE, MERCURIC SULFATE, CALCIUM PHOSPHIDE, FORMALDEHYDE, ALKALIES, CARBONATES, STRONG BASES, SULFURIC ACID, CHLOROSULFONIC ACID

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, HYDROGEN, CHLORINE

CONTINUED ON PAGE: 6

SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRASORB(R) OR TEAM(R) 'LOW NA+' ACID NEUTRALIZERS ARE FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002 (CORROSIVE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ACID CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.
EYE/SKIN PROTECTION:	SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, NEOPRENE GLOVES ARE RECOMMENDED.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: WHITE (CORROSIVE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. ISOLATE FROM INCOMPATIBLE MATERIALS. DO NOT STORE NEAR OXIDIZING MATERIALS.

CONTINUED ON PAGE: 7

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

APPROVED BY QUALITY ASSURANCE DEPARTMENT.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS: 8
UN/NA: UN1789 REPORTABLE QUANTITY: 5000 LBS. PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS: 8 I.M.O. PAGE: 8183
UN: UN1789 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: HYDROCHLORIC ACID, SOLUTION
HAZARD CLASS: 8
UN: UN1789 PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA*** WE BELIEVE THE TRANSPORTATION DATA AND REFERENCES CONTAINED HEREIN TO BE FACTUAL AND THE OPINION OF QUALIFIED EXPERTS. THE DATA IS MEANT AS A GUIDE TO THE OVERALL CLASSIFICATION OF THE PRODUCT AND IS NOT PACKAGE SIZE SPECIFIC, NOR SHOULD IT BE TAKEN AS A WARRANTY OR REPRESENTATION FOR WHICH THE COMPANY ASSUMES LEGAL RESPONSIBILITY.*** THE INFORMATION IS OFFERED SOLELY FOR YOUR CONSIDERATION, INVESTIGATION, AND VERIFICATION. ANY USE OF THE INFORMATION MUST BE DETERMINED BY THE USER TO BE IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. SEE SHIPPER REQUIREMENTS 49CFR 172.3 AND EMPLOYEE TRAINING 49CFR 173.1.

U.S. CUSTOMS HARMONIZATION NUMBER: 28061000000

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J.T.BAKER INC. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865
M A T E R I A L S A F E T Y D A T A S H E E T
24-HOUR EMERGENCY TELEPHONE -- (908) 859-2151
CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

NITRIC ACID, VOLUMETRIC SOLUTION

J.T.BAKER INC., 1037 LOWER BROWNSVILLE RD., JACKSON, TN 38301

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: NITRIC ACID, VOLUMETRIC SOLUTION
COMMON SYNONYMS: N/A
CHEMICAL FAMILY: VOLUMETRIC SOLUTIONS AND CONCENTRATES
FORMULA: HNO3
FORMULA WT.: 63.01
CAS NO.: 7697-37-2
NIOSH/RTECS NO.: QU5775000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 5600

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	2	MODERATE
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER
CAUSES SEVERE IRRITATION. HARMFUL IF SWALLOWED OR INHALED.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. LOOSEN CLOSURE CAUTIOUSLY. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF SPILL NEUTRALIZE WITH SODA ASH OR LIME AND PLACE IN DRY CONTAINER.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

CONTINUED ON PAGE: 2

SECTION IV - FIRE AND EXPLOSION HAZARD DATA (CONTINUED)

UNUSUAL FIRE & EXPLOSION HAZARDS
REACTS WITH MOST METALS TO PRODUCE HYDROGEN GAS, WHICH CAN FORM AN EXPLOSIVE MIXTURE WITH AIR.

TOXIC GASES PRODUCED
OXIDES OF NITROGEN

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 5 MG/M3 (2 PPM)

LV IS FOR NITRIC ACID.

SHORT-TERM EXPOSURE LIMIT (STEL): 10 MG/M3 (4 PPM)

STEL IS FOR NITRIC ACID.

PERMISSIBLE EXPOSURE LIMIT (PEL): 5 MG/M3 (2 PPM)

PEL IS FOR NITRIC ACID.

TOXICITY OF COMPONENTS

INHALATION-1HR RAT LC50 FOR NITRIC ACID	2500	PPM
INTRAPERITONEAL MOUSE LD50 FOR WATER	190	G/KG
INTRAVENOUS MOUSE LD50 FOR WATER	25	G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

CONTINUED ON PAGE: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EXTREMELY HAZARDOUS SUBSTANCE:	YES	CONTAINS NITRIC ACID (RQ = 1,000 LBS, TPQ = 1,000 LBS)
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS NITRIC ACID (RQ = 1000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS NITRIC ACID
GENERIC CLASS:		C16
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT

INCOMPATIBLES: STRONG BASES, STRONG REDUCING AGENTS, ALKALIES, MOST COMMON METALS

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN

SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. NEUTRALIZE SPILL WITH SODA ASH OR LIME. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

J. T. BAKER NEUTRASORB(R) OR TEAM(R) 'LOW NA+' ACID NEUTRALIZERS ARE FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002 (CORROSIVE WASTE)

CONTINUED ON PAGE: -6

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PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

chemists helping chemists in research & industry

aldrich chemical co.

P.O. Box 355, Milwaukee, Wisconsin 53201 USA

Telephone: (414) 273-3850
TWX: (910) 262-3052 Aldrichem MI
Telex: 26 843 Aldrich MI
FAX: (414) 273-4979

ATTN: SAFETY DIRECTOR
CH2M HILL INC
310 W WISCONSIN AVE
SUITE 700
MILWAUKEE WI 53201

DATE: 03/13/89
CUST # 922934 P.O. # ARC5089

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

PRODUCT # 25810-5 NAME: SULFURIC ACID, 95-98%, A.C.S. REAGENT
CAS # 7664-93-9
MF: H_2O_4S

SYNONYMS
ACIDE SULFURIQUE (FRENCH) * ACIDO SOLFORICO (ITALIAN) * BOV * DIPPING ACID * HYDROGEN SULFATE (DOT) * MATTING ACID (DOT) * NORDHAUSEN ACID (DOT) * OIL OF VITRIOL * OIL OF VITRIOL (DOT) * SPENT SULFURIC ACID (DOT) * SULFURIC ACID (ACGIH,DOT) * SULFURIC ACID, SPENT (DOT) * SULPHURIC ACID * SCHWEFELSAEURELOESUNGEN (GERMAN) * UN 1830 (DOT) * UN 1832 (DOT) * VITRIOL BROWN OIL * VITRIOL, OIL OF (DOT) * ZWAVELZUUROPLOSSINGEN (DUTCH) *

TOXICITY HAZARDS

RTECS # WS5600000
SULFURIC ACID

IRRITATION DATA

EYE-RBT 1380 UG SEV	AJOPAA 29,1363,46
EYE-RBT 5 MG/30S RINSE SEV	TXCYAC 23,281,82

TOXICITY DATA

UNR-MAN LDLO:135 MG/KG	85DCAI 2,73,70
ORL-RAT LD50:2140 MG/KG	AIHAAP 30,470,69
IHL-RAT LC50:510 MG/M3/2H	85GMAT -,107,82
IHL-MUS LC50:320 MG/M3/2H	85GMAT -,107,82
IHL-GPG LC50:18 MG/M3	MELAAD 45,590,54

REVIEWS, STANDARDS, AND REGULATIONS
ACGIH TLV-TWA 1 MG/M3; STEL 3 MG/M3 85INA8 5,544(87),86
MSHA STANDARD-AIR:TWA 1 MG/M3 DTLVS* 3,239,71
OSHA STANDARD-AIR:TWA 1 MG/M3 FEREAC 39,23540,74
NIOSH REL TO SULFURIC ACID-AIR:TWA 1 MG/M3 NWWR** 37(S-7),25,88
EPA TSCA CHEMICAL INVENTORY, 1986
EPA TSCA SECTION 8(E) STATUS REPORT 8EHQ-0985-0566
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JANUARY 1989
NIOSH ANALYTICAL METHODS: SEE ACIDS, INORGANIC, 7903
MEETS CRITERIA FOR PROPOSED OSHA MEDICAL RECORDS RULE FEREAC 47,30420, 82

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATI

HEALTH HAZARD DATA

ACUTE EFFECTS
MAY BE FATAL IF SWALLOWED.
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.
CAUSES BURNS.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.

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MATERIAL SAFETY DATA SHEET

CATALOG # 25810-5 NAME: SULFURIC ACID, 95-98%, A.C.S. REAGENT

FIRST AID
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF EXPOSURE, OBTAIN MEDICAL ATTENTION IMMEDIATELY.
WASH CONTAMINATED CLOTHING BEFORE REUSE.
DISCARD CONTAMINATED SHOES.

PHYSICAL DATA

SPECIFIC GRAVITY: 1.840
VAPOR DENSITY: <.3 @ 25 C
VAPOR PRESSURE: 1.0 MM @ 145.8 C
APPEARANCE: VISCOUS COLORLESS LIQUID

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: NONE
EXTINGUISHING MEDIA
NONCOMBUSTIBLE.
USE EXTINGUISHING MEDIA APPROPRIATE TO SURROUNDING FIRE CONDITIONS.
DO NOT USE WATER.
SPECIAL FIRE FIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
STRONG OXIDIZER.
CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
UNUSUAL FIRE AND EXPLOSION HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

REACTIVITY DATA

INCOMPATIBILITIES
BASES
HALIDES
AVOID CONTACT WITH METALS.
DO NOT ALLOW WATER TO ENTER CONTAINER BECAUSE OF VIOLENT REACTION.
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
SULFUR OXIDES

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
COVER WITH DRY-LIME, SAND, OR SODA ASH. PLACE IN COVERED CONTAINERS USING NON-SPARKING TOOLS AND TRANSPORT OUTDOORS.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
WASTE DISPOSAL METHOD
FOR SMALL QUANTITIES: CAUTIOUSLY ADD TO A LARGE STIRRED EXCESS OF WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS OR LIQUIDS AND PACKAGE THEM FOR HAZARDOUS-WASTE DISPOSAL. FLUSH THE AQUEOUS SOLUTION DOWN THE DRAIN WITH PLENTY OF WATER. THE HYDROLYSIS AND NEUTRALIZATION REACTIONS MAY GENERATE HEAT AND FUMES WHICH CAN BE CONTROLLED BY THE RATE OF ADDITION.

OBSERVE ALL FEDERAL, STATE & LOCAL LAWS.

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MATERIAL SAFETY DATA SHEET

CATALOG # 25810-5 NAME: SULFURIC ACID, 95-98%, A.C.S. REAGENT

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ----

WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
MECHANICAL EXHAUST REQUIRED.
SAFETY SHOWER AND EYE BATH.
FACESHIELD (8-INCH MINIMUM).
AVOID BREATHING VAPOR.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
POISON.
CORROSIVE.
KEEP TIGHTLY CLOSED.
REACTS VIOLENTLY WITH WATER.
DO NOT STORE NEAR, NOR ALLOW CONTACT WITH, CLOTHING AND OTHER COMBUSTIBLE MATERIAL.
STORE IN A COOL DRY PLACE.

---------- ADDITIONAL PRECAUTIONS AND COMMENTS ----------

ADDITIONAL INFORMATION
INCOMPATIBLE WITH CARBIDES, CHLORATES FULMINATES, NITRATES, PICRATES, CYANIDES, ALKALI HALIDES, NITRITES, ZINC IODIDE, PERMANGANATES, HYDROGEN PEROXIDE, AZIDES, PERCHLORATES, NITROMETHANE, PHOSPHOROUS.
VIOLENT REACTION WITH: CYCLOPENTADIENE, CYCLOPENTANONE OXIME, NITROARYL AMINES, HEXALITHIUM DISILICIDE, PHOSPHOROUS(III) OXIDE.

---------------- REGULATORY INFORMATION ----------------

THIS PRODUCT IS SUBJECT TO SARA SECTION 313 REPORTING REQUIREMENTS.

J.T.BAKER INC., 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: SODIUM HYDROXIDE, 50% SOLUTION
COMMON SYNONYMS: CAUSTIC SODA; SODIUM HYDRATE; LYE
CHEMICAL FAMILY: AQUEOUS SOLUTIONS
FORMULA: NAOH IN H2O
FORMULA WT.: 40.00
CAS NO.: 1310-73-2
NIOSH/RTECS NO.: WB4900000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 3727,3735,3725

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	2	MODERATE
CONTACT	-	4	EXTREME (CORROSIVE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER
HARMFUL IF INHALED. CAUSES SEVERE BURNS. MAY BE FATAL IF SWALLOWED. REACTS VIOLENTLY WITH ACIDS.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF SPILL, CAREFULLY NEUTRALIZE SPILL WITH DILUTE HCL. FLUSH SPILL AREA WITH WATER.

INTERNATIONAL LABELING

CAUSES SEVERE BURNS.
KEEP OUT OF REACH OF CHILDREN. IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE. TAKE OFF IMMEDIATELY ALL CONTAMINATED CLOTHING. WEAR SUITABLE GLOVES AND EYE/FACE PROTECTION.

CONTINUED ON PAGE: 2

PRECAUTIONARY LABELING (CONTINUED)

SAF-T-DATA* STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
SODIUM HYDROXIDE	1310-73-2	50	2 MG/M3	2 MG/M3
WATER	7732-18-5	50	N/E	N/E

THE TLV AND PEL LISTED FOR SODIUM HYDROXIDE DENOTE CEILING LIMITS.

SECTION III - PHYSICAL DATA

BOILING POINT: 142 C (287 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): 1
(20 C)

MELTING POINT: 12 C (53 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 1.53
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): COMPLETE (100%)

% VOLATILES BY VOLUME: 50
(21 C)

PH: 14.0 (1.0M SOLUTION)

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: LIQUID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: CLEAR, COLORLESS VISCOUS LIQUID. ODORLESS.

CONTINUED ON PAGE: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINQUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. FLOOD WITH WATER SPRAY TO PREVENT SPLASHING OF MATERIAL.

UNUSUAL FIRE & EXPLOSION HAZARDS
REACTS WITH MOST METALS TO PRODUCE HYDROGEN GAS, WHICH CAN FORM AN EXPLOSIVE MIXTURE WITH AIR.

TOXIC GASES PRODUCED
NONE IDENTIFIED

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 2 MG/M3

TLV (CEILING) IS FOR SODIUM HYDROXIDE.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 2 MG/M3

PEL (CEILING) IS FOR SODIUM HYDROXIDE.

CONTINUED ON PAGE: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

TOXICITY OF COMPONENTS

INTRAPERITONEAL MOUSE LD50 FOR SODIUM HYDROXIDE	40	MG/KG
INTRAPERITONEAL MOUSE LD50 FOR WATER	190	G/KG
INTRAVENOUS MOUSE LD50 FOR WATER	25	G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: SEVERE IRRITATION OR BURNS OF RESPIRATORY SYSTEM, PULMONARY EDEMA, LUNG INFLAMMATION, MAY CAUSE RESPIRATORY SYSTEM DAMAGE

SKIN CONTACT: BURNS

EYE CONTACT: BURNS, PERMANENT EYE DAMAGE

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: IS HARMFUL AND MAY BE FATAL. SEVERE BURNS TO MOUTH, THROAT, AND STOMACH, NAUSEA, VOMITING

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS
EYES, SKIN, RESPIRATORY SYSTEM, LUNGS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
DAMAGED SKIN

PRIMARY ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

CONTINUED ON PAGE: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. FOLLOW WITH DILUTED VINEGAR, FRUIT JUICE OR WHITES OF EGGS BEATEN WITH WATER.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

NOTES TO PHYSICIAN

IN CASES OF SEVERE ESOPHAGEAL CORROSION, THE USE OF THERAPEUTIC DOSES OF STEROIDS SHOULD BE CONSIDERED. GENERAL SUPPORTIVE MEASURES WITH CONTINUAL MONITORING OF GAS EXCHANGE, ACID-BASE BALANCE, ELECTROLYTES, AND FLUID INTAKE ARE ALSO REQUIRED.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	NO	
CERCLA HAZARDOUS SUBSTANCE:	YES	CONTAINS SODIUM HYDROXIDE (RQ = 1000 LBS)
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS SODIUM HYDROXIDE
GENERIC CLASS:		GENERIC CLASS REMOVED FROM CFR: 7/1/91
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT

CONTINUED ON PAGE: 6

SECTION VI - REACTIVITY DATA (CONTINUED)

INCOMPATIBLES: STRONG ACIDS, MOST COMMON METALS, COMBUSTIBLE MATERIALS, ORGANIC MATERIALS, WATER, ZINC, ALUMINUM, PEROXIDES, HALOGENATED HYDROCARBONS

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. VENTILATE AREA. CAREFULLY NEUTRALIZE SPILL WITH DILUTE HCL. FLUSH AREA WITH FLOODING AMOUNTS OF WATER. (USE CAUTION.)

J. T. BAKER NEUTRACIT(R)-2 OR BUCAIM(R) CAUSTIC NEUTRALIZERS ARE RECOMMENDED SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D002, D003 (CORROSIVE, REACTIVE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 100 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, NEOPRENE GLOVES ARE RECOMMENDED.

CONTINUED ON PAGE: 7

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. ISOLATE FROM INCOMPATIBLE MATERIALS. DO NOT STORE BELOW 12 C.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, SOLUTION
HAZARD CLASS: 8
UN/NA: UN1824 REPORTABLE QUANTITY: 1000 LBS. PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, SOLUTION
HAZARD CLASS: 8 I.M.O. PAGE: 8226
UN: UN1824 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: SODIUM HYDROXIDE, SOLUTION
HAZARD CLASS: 8
UN: UN1824 PACKAGING GROUP: II
LABELS: CORROSIVE
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA*** WE BELIEVE THE TRANSPORTATION DATA AND REFERENCES CONTAINED HEREIN TO BE FACTUAL AND THE OPINION OF QUALIFIED EXPERTS. THE DATA IS MEANT AS A GUIDE TO THE OVERALL CLASSIFICATION OF THE PRODUCT AND IS NOT PACKAGE SIZE SPECIFIC, NOR SHOULD IT BE TAKEN AS A WARRANTY OR REPRESENTATION FOR WHICH THE COMPANY ASSUMES LEGAL RESPONSIBILITY.*** THE INFORMATION IS OFFERED SOLELY FOR YOUR CONSIDERATION, INVESTIGATION, AND VERIFICATION. ANY USE OF THE INFORMATION MUST BE DETERMINED BY THE USER TO BE IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. SEE SHIPPER REQUIREMENTS 49CFR 172.3 AND EMPLOYEE TRAINING 49CFR 173.1.

CONTINUED ON PAGE: 8

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (CONTINUED)

U.S. CUSTOMS HARMONIZATION NUMBER: 28151200007

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.

EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

***

APPROVED BY QUALITY ASSURANCE DEPARTMENT.

-- LAST PAGE --

Baxter Healthcare Corporation
Burdick & Jackson Division
1953 South Harvey Street
Muskegon, MI 49442 USA

information/emergency telephone no. 616.726.3171
chemtrec telephone no. 800.424.9300
canadian emergency telephone no. 613.996.6666

MATERIAL SAFETY DATA SHEET

ISOPROPYL ALCOHOL

I. Identification

chemical name: Isopropyl Alcohol — molecular weight: 60.09
chemical family: Alcohol — formula: C_3H_8O
synonyms: 2-Propanol, Isopropanol
DOT proper shipping name: Isopropyl Alcohol or Isopropanol
DOT hazard class: Flammable Liquid
DOT identification no.: UN1219 — CAS no.: 67-63-0

II. Physical and Chemical Data

boiling point, 760mm Hg.: 82.26°C — freezing point: -88.0°C — evaporation rate: (BuAc=1) ca 3
vapor pressure at 20°C: 32.4 mm Hg — vapor density (air=1): 2.1 — solubility in water: @ 20°C complete
% volatiles by volume: ca 100 — specific gravity (H_2O=1): @ 20°C 0.785 — stability: Stable
hazardous polymerization: Not expected to occur.
appearance and odor: Clear, colorless liquid with a slight alcoholic odor.
conditions to avoid: Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid: Strong oxidizing agents, strong acids, and reactive metals, including aluminum, which will displace hydrogen.

hazardous decomposition products: Incomplete combustion can generate carbon monoxide and other toxic vapors.

III. Fire and Explosion Hazard Data

flash point, (test method): 12°C (Tag closed cup) — auto ignition temperature: 399°C
flammable limits in air % by volume: lower limit: 2.0 — upper limit: 12.0
unusual fire and explosion hazards: Volatile and flammable.

extinguishing media: Carbon dioxide, dry chemical, alcohol foam, water mist or fog.

special fire fighting procedures: Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and rupture closed storage containers. Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

Isopropyl Alcohol	% ca 100	TLV 400 ppm	CAS no. 67-63-0

V. Health Hazards

Occupational Exposure Limits

OSHA	TWA	- 400 ppm
	STEL	- 500 ppm
	Ceiling	- not listed
ACGIH	TLV-TWA	- 400 ppm
	TLV-STEL	- 500 ppm
NIOSH	10 hour TWA	- 400 ppm
	15 min Ceiling	- 800 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH	12,000 ppm

Odor Threshold

NSC	50 ppm

Carcinogenic Data

Isopropyl alcohol is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry

Isopropyl alcohol may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause coughing, shortness of breath, dizziness, and intoxication.

Eye Contact: Liquid and high vapor concentration can cause moderate burning, watering, swelling, and redness.

Skin Contact: Extensive, repeated and/or prolonged skin contact can cause burning, itching, redness, and dermatitis.

Ingestion: Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 250 mL of isopropyl alcohol can cause death.

Effects of Overexposure

Isopropyl alcohol is a mild eye and mucous membrane irritant and central nervous system depressant. Acute exposure can cause gastrointestinal tract upset and narcosis.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals susceptible to dermatitis.

Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

VI. Safety Measures and Equipment

Ventilation: Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory: Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes: Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin: Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene, nitrile rubber, or natural rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to isopropyl alcohol may require additional protective equipment.

Storage: Isopropyl alcohol should be protected from temperature extremes and direct sunlight. Proper storage of isopropyl alcohol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, isopropyl alcohol should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.

Waste Disposal: Dispose of isopropyl alcohol as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste number: D001(Ignitable).

VIII. SARA/Title III Data

Hazard Classification	
Immediate Health	Yes (irritant)
Delayed Health	No
Fire	Yes
Sudden Release	No
Reactive	No

Chemical Listings	
Extremely Hazardous Substances	No
CERCLA Hazardous Substances	No
Toxic Chemicals	No

Isopropyl alcohol is not subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

KEY

ca	Approximately
na	Not applicable
C	Ceiling
STEL	Short Term Exposure Level (15 minutes)
TLV	Threshold Limit Value
TWA	Time Weighted Average (8 hours)
BuAc	Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd Ed., 1988)

MATERIAL SAFETY DATA SHEET
CFR 1910.1200 OSHA Hazard
Communication Rule Format

MINE SAFETY APPLIANCES COMPANY
P. O. Box 426
Pittsburgh, PA 15230
PHONE (412) 967-3000

PRODUCT IDENTITY

LABEL IDENTITY - P/N 34337 Cleaner - Sanitizer II

CHEMICAL NAME - See Applicable Chemical Contents

NOTE: Product is packaged in 2 ounce packets.

APPLICABLE CHEMICAL CONTENTS

		%	TLV/TWA
Alkyl (C14-50%, C12-40%, C16-10%) Dimethyl Bensyl Ammonium Chloride	CAS 68424-85-1	2.5	none established
Sodium Carbonate	CAS 497-19-8	25-50	none established
ium Bicarbonate	CAS 144-55-8	10-25	none established
Pentasodium Triphosphate	CAS 7758-29-4	10-25	none established
Water	CAS 7732-18-5	5-10	none established
Trisodium Phosphate	CAS 7601-54-9	1-10	none established
Nonoxynol-10	CAS 127087-87-0	1-5	none established
Ethanol	CAS 64-17-5	0.1-1	1000 ppm

N/A - Not Applicable

MSA P/N 34337

PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR - White Powder, Unscented

BOILING POINT - N/A

VAPOR PRESSURE - N/A

VAPOR DENSITY (AIR = 1) - N/A

SOLUBILITY IN WATER - 20%

SPECIFIC GRAVITY (H2O = 1) - 0.8

PERCENT VOLATILE BY VOLUME - N/A

pH 1% Aqueous Solution - 9.5-10.5

PHYSICAL HAZARD INFORMATION

PHYSICAL HAZARD - Not a physical hazard as defined by OSHA's Hazard Communication Standard 29 CFR 1910.1200.

CONDITIONS OR MATERIALS TO AVOID - Avoid oxidizing agents. Soaps and anionic surfactants deactivate germicide.

FLASH POINT - No flash to 240°F LEL N/A UEL N/A

EXTINGUISHING MEDIA - Water spray (fog), foam, dry chemical, carbon dioxide.

SPECIAL FIRE FIGHTING PROCEDURES - Products of combustion are toxic. Wear impervious covering and pressure demand type self-contained breathing apparatus with full facepiece.

UNUSUAL FIRE AND EXPLOSION HAZARDS - See preceding item. Product is nonreactive and does not readily support combustion.

HEALTH HAZARDS

HEALTH HAZARDS - The powder product contains components which are toxic, corrosive and/or irritant.
Ingestion of the product is harmful or fatal.

MSA P/N 34337

Toxicity Data

Alkyl (C14 50%; C12 40%; C16 10%) Dimethyl Benzyl Ammonium Chloride CAS 68424-85-1
- Oral (RAT) LD50 0.43 ML/KG
- Dermal LD50 (RABBIT) 3.56 ML/KG
- Skin (RABBIT) 0.5 ML/24H Severe Irritant
- Eye (RABBIT) 0.1 ML Severe irritation

Sodium Carbonate CAS 497-19-8
- Oral (RAT) LD50 2.8 GM/KG
- Oral (RAT) LD50 4090 MG/KG
- Skin (RABBIT) 500 MG/24 H Moderate
- Eye (RABBIT) 100 MG/24 H Moderate

Sodium Bicarbonate CAS 144-55-8
- Oral (INF.) TDLO 1260 MG/KG
- Oral (RAT) LD50 4220 MG/KG
- Skin (HMN) 30 MG/3D-I Mild
- Eye (RABBIT) 100 MG/30 Sec. Rinse - Mild

Pentasodium Triphosphate CAS 7758-29-4
- Oral (RAT) LD50 4100 MG/KG
- Oral (MOUSE) LD50 3210 MG/KG
- Skin - No Data Found
- Eyes - No Data Found
- According to a vendor, this material is essentially non-irritating.

Trisodium Phosphate CAS 7601-54-9
- Oral (RAT) LD50 5500 MG/KG
- Oral (RAT) LD50 7400 MG/KG
- Skin (RABBIT) LD50 > 7940 MG/KG
- Eyes - Irritating

Nonoxynol - 10 CAS 127087-87-0
- No oral or dermal toxicity data found.
- Eyes - severe irritant to eyes; possible corneal injury.
- Repeated contact may irritate the skin.

Ethanol CAS 64-17-5
- Oral (HMN) LDL0 1400 MG/KG
- Oral (RAT) LD50 7060 MG/KG
- Oral (MOUSE) LD50 3450 MG/KG
- Eye (RABBIT) 100 MG/24 Hr Severe
- Skin (RABBIT) 500 MG/24 Hr Severe
- Skin (RABBIT) 20 MG/24 Hr Moderate

PRIMARY ROUTES OF ENTRY - Ingestion, skin contact, eye contact, inhalation.

MSA P/N 34337

SIGNS AND SYMPTOMS OF EXPOSURE--

Ingestion of powder - Burning in mouth, throat, abdomen, severe swelling of larynx, muscle paralysis, convulsions.

Skin contact with powder - Irritation, may cause burns.

Eye contact with powder - Strong irritation, may cause corneal burns.

Inhalation - Irritation of mucous membranes.

NOTE: Inhalation of a quantity of powder sufficient to pose a significant health hazard is improbable under conditions intended use.

TARGET ORGANS - Larynx, mucous membranes, digestive tract.

MEDICAL CONDITIONS GENERALLY RECOGNISED AS BEING AGGRAVATED BY EXPOSURE - No Information.

EXPOSURE LIMITS - Refer to TLV/TWA on page 1 under Applicable Chemical Contents.

CARCINOGENICITY DATA - Product components are not listed by OSHA, NTP, or IARC.

EMERGENCY AND FIRST AID PROCEDURES -

Ingestion: Drink milk, raw egg white, or gelatin solution, or large quantities of water. Avoid alcohol. SEE A PHYSICIAN IMMEDIATELY.

Note to Physician: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsion may be needed.

Skin contact with powder: Flush affected area with clean water.

Eye contact with powder: Avoid rubbing eyes as water insoluble particles may scratch cornea. Immediately flush eyes with clean water while holding eyelids apart. Continue flushing for at least 15 minutes or until irritation subsides. Consult a physician as soon as possible.

Inhalation of powder: Remove from exposure. See a physician if irritation persists.

MSA P/N 34337

SAFE HANDLING AND USE

HYGIENIC PRACTICES - Thoroughly rinse off any powder product contacted by skin surfaces.

PROTECTIVE MEASURES DURING REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT N/A

PROCEDURES FOR SPILL OR LEAK CLEANUP - Sweep up packet contents. Avoid dusting conditions.

WASTE DISPOSAL - Dispose surplus product in accordance with local, state, and federal laws and regulations.

STORAGE - Store in a clean, dry place.

CONTROL MEASURES

PERSONAL PROTECTIVE EQUIPMENT - Wear rubber gloves to prevent skin contact th powder and to avoid frequent or extended skin contact with solution. ear goggles to prevent eye contact with driven powder and to prevent eye splash with solution. A face shield can provide additional protection.

ENGINEERING CONTROLS - Not applicable.

WORK PRACTICES - Avoid dusting conditions. Remove and wash contaminated clothing. Do not mix this product with other cleaning products as soaps, anionic surfactants and oxidizing agents deactivate the germicide.

DATE OF PREPARATION - Rev. 3, February 1992

The information provided herein has been compiled from sources believed to be reliable. However, Mine Safety Appliances Company makes no warranty as to the accuracy, completeness, or sufficiency of the information and in no event will Mine Safety Appliances Company be responsible for loss or damage of any nature whatsoever resulting from use of the information.

FROM: **ALCONOX** *Inc.*

Quality Detergents for Laboratories, Hospitals, Industry
215 PARK AVENUE SOUTH NEW YORK, N. Y. 10003

FAX: 212-353-1342 Tel. 473-1300 • Area Code 212

TO: ______
ATTN: ______
FAX #: ______

DATE: ______
PAGE ___ OF ___
FROM: ______

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): ALCONOX

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: ALCONOX, INC.
Emergency Telephone Number: (212) 473-1300
Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH, NEW YORK, N.Y. 10003
Telephone Number for Information: (212) 473-1300
Date Prepared: JULY 1, 1987
Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s)) | OSHA PEL | ACGIH TLV | Other Limits Recommended | % (optional)

THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART-Z.

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water: APPRECIABLE (GREATER THAN 10 PER CENT)
Appearance and Odor: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES — ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used): NONE
Flammable Limits | LEL: N.A. | UEL: N.A.
Extinguishing Media: WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH
Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.
Unusual Fire and Explosion Hazards: NONE

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		NONE
	Stable	XX	

Incompatibility (Materials to Avoid): AVOID STRONG ACIDS
Hazardous Decomposition or Byproducts: MAY RELEASE CO_2 GAS ON BURNING

Hazardous Polymerization			Conditions to Avoid
	May Occur		NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? NO Ingestion? YES
Health Hazards (Acute and Chronic): INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.
Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO
Signs and Symptoms of Exposure: EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.
Medical Conditions Generally Aggravated by Exposure: RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.
Emergency and First Aid Procedures: EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATE[R] INGESTION-DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR DISCOMFO[RT]

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled: MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.
Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGEN[TS]
Precautions to Be Taken in Handling and Storing: STORE IN A DRY AREA TO PREVENT CAKING.
Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (Specify Type): DUST MASK

Ventilation			
Local Exhaust	NORMAL	Special	N.A.
Mechanical (General)	N.A.	Other	N.A.

Protective Gloves: USEFUL-NOT REQUIRED Eye Protection: USEFUL-NOT REQUIRED
Other Protective Clothing or Equipment: NOT REQUIRED
Work/Hygienic Practices: NO SPECIAL PRACTICES REQUIRED

FROM: **ALCONOX, Inc.**

Quality Detergents for Laboratories, Hospitals, Industry

215 PARK AVENUE SOUTH NEW YORK, N. Y. 10003

FAX: 212-353-1342 Tel. 473-1300 • Area Code 212

TO: _____ DATE: _____

ATTN: _____ PAGE ___ OF ___

FAX #: _____ FROM: _____

erial Safety Data Sheet
be used to comply with
S's Hazard Communication Standard,
FR 1910.1200. Standard must be
ailed for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

ITY (As Used on Label and List): LIQUI-NOX

ion I

Manufacturer's Name: ALCONOX, INC.

Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH, NEW YORK, NEW YORK 10003

Emergency Telephone Number: (212) 473-1300

Telephone Number for Information: (212) 473-1300

Date Prepared: August 1, 1990

Signature of Preparer (optional):

ion II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

THERE ARE NO INGREDIENTS IN LIQUI-NOX WHICH REPRESENT ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.

ion III — Physical/Chemical Characteristics

Boiling Point	212°F	Specific Gravity (H_2O = 1)	1.175
Vapor Pressure (mm Hg.)	NO DATA	Melting Point	N.A.
Vapor Density (Air = 1)	NO DATA	Evaporation Rate (Butyl Acetate = 1)	NO DATA

Solubility in Water: COMPLETELY SOLUBLE IN ALL PROPORTIONS

Appearance and Odor: YELLOW LIQUID - PRACTICALLY ODORLESS

ion IV — Fire and Explosion Hazard Data

	Flammable Limits	LEL	UEL
Flash Point (Method Used): NONE (CLEVELAND OPEN CUP)		N.A.	N.A.

Extinguishing Media: WATER, DRY CHEMICAL, FOAM, CO_2, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL, DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards:

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: NONE
	Stable	YES	

Incompatibility (Materials to Avoid): NONE

Hazardous Decomposition or Byproducts: SO_2 MAY BE RELEASED ON BURNING

Hazardous Polymerization	May Occur		Conditions to Avoid: NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	NO	YES	YES

Health Hazards (Acute and Chronic): SKIN CONTACT MAY PROVE LOCALLY IRRITATING. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP? NO | IARC Monographs? NO | OSHA Regulated? NO

Signs and Symptoms of Exposure: PROLONGED SKIN CONTACT MAY CAUSE DRYING AND/OR CRACKING

Medical Conditions Generally Aggravated by Exposure: NONE

Emergency and First Aid Procedures: EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES. SKIN-FLUSH WITH WATER. INGESTION-DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR IN

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled: MATERIAL FOAMS PROFUSELY. RECOVER AS MUCH AS POSSIBLE WITH ABSORBENT MATERIAL FOAMS PROFUSELY. RECOVER AS MUCH AS POSSIBLE WITH ABSORBENT MATERIAL AND RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADA

Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE SOAKED UP WITH ABSORBENT MATERIAL AND DISPOSED OF ACCORDING TO LOCAL ORDI

Precautions to Be Taken in Handling and Storing: NONE REQUIRED -VISCOSITY OF MATERIAL INCREASES AT VERY LOW TEMPERATURES.

Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (Specify Type):

Ventilation	Local Exhaust: NORMAL	Special: N.A.	
	Mechanical (General): N.A.	Other: N.A.	
Protective Gloves: RECOMMENDED		Eye Protection: RECOMMENDED	

Other Protective Clothing or Equipment:

4. Environmental Protection and Waste Management Plan

This section presents an Environmental Protection Plan describing the measures and permit requirements applied to protect the natural resources during construction and restoration work. The Environmental Protection Plan follows the format provided by NAVFAC Standard Specification Section 01570 (03/96 edition).

This section also provides a Waste Management Plan describing the provisions taken to handle, store and dispose of wastes generated during construction and site restoration. Other additional control measures provided for the construction and site restoration are provided in Specifications 01570 Temporary Controls of the Workplan Section 5.0 Construction Specifications.

4.1 Environmental Protection Plan

4.1.1 Contractor Organization

Primary Contractor: Navy Public Works San Francisco Bay (PWCSFB). Project manager is Pete Zucca, (510) 302-4257. Construction forman is Harold Kaihiwa, (510) 302-3079. Responsible for the overall project, including construction and site restoration work at the NWSC.

Hazardous Waste Contractor: Laidlaw Environmental Services. Point of contact is Jeff Lew, (510) 302-5287. Responsible for temporary storage, handling, transporting and disposal of all wastes generated in the field.

Environmental Contractor: CH2M HILL. Project manager is Winifred Au, (510) 251-2426. Responsible for preparation of the work plan, field sampling and analytical services, and preparation of summary report.

4.1.2 Hazardous Waste Materials

The hazardous waste materials brought to the site for the construction and site restoration are primarily chemicals used for decontaminating field equipment and chemicals used for calibrating the air monitoring field equipment. These hazardous waste materials are documented in Section 3.7 of the Health and Safety Plan (HSP).

The potential hazardous waste generated during construction and site restoration work are summarized in Table 4.1. In addition, rinse water used for decontaminating field equipment and disposable protective clothing will also be generated during field activities.

4.1.3 MSDS Package

The MSDS package is included in Attachment 2 of the HSP.

Table 4.1
Estimated Waste from Various SWMU Sites
Naval Weapons Station, Concord

SWMU Site	Associated Building	Estimated Volume of Waste[a]			Chemicals of Concern
		Wastewater (gal.)	Sludge (gal.)	Soil (cubic ft)	
12	IA-24	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for some metals
13	IA-25	1,800	1,200	NA	Potential RCRA Waste
14	IA-27	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for zinc
17	IA-50	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for zinc
20	IA-55	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for some metals
23	87	675	450	NA	Nonhazardous, may exceed CCCSD discharge limits for zinc
24	93	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for some metals
44	350	1,800	1,200	NA	Nonhazardous, may exceed CCCSD discharge limits for zinc
54	79	3,600[b]	2,400[b]	NA	Expected to be nonhazardous waste
16	IA-46	NA	NA	2,200 (122 cubic yards)	DDT
40	174	NA	NA	96 (5.3 cubic yards)	PCBs

[a] Volume of waste estimated assuming sludge is 2 feet deep and wastewater is 3 feet deep.
Tank sites without drawings are assumed to contain a 3,000 gallon tank. Waste volumes will be updated after field sampling.

[b] Drawings indicate that the original tank was replaced with a 6,000 gallon tank.

[c] Chemicals of concern provided by EFA West in July 1996 for the nine septic tanks.

The employee training documentation is included in Appendix A.

4.1.4 Hazardous Waste Storage Plan

Provisions for hazardous waste storage are discussed in Section 4.2.

4.1.5 Preconstruction Survey Results

Table 4.1 lists the potential constituents of concern identified from the previous sampling program conducted for the project sites. Other site-specific conditions and access for field sampling and construction activities obtained from the field reconnaissance on July 22, 1996, are summarized in the meeting minutes included in Appendix B.

4.1.6 Permitting Requirements

A special waste discharge permit will be obtained from the CCCSD to allow discharge of wastewater and rinse water removed from the ten septic tanks. If required, the other waste disposal permit(s) will be obtained by Laidlaw Environmental Services to handle the disposal of sludge not accepted by CCCSD and generated from the ten septic tanks and contaminated soils generated from SWMU Sites 16 and 40.

4.2 Waste Management Plan

Five types of waste will be generated during the activities described in this work plan:

- Septic wastewater
- Septic sludge
- Excavated soil
- Rinse water from septic tanks and decontamination of field equipment
- Disposable protective clothing

During the construction and site restoration work at the NWSC, Laidlaw Environmental Services primarily will be responsible for temporary storage, handling, transportation and disposal of all hazardous wastes generated in the field. PWC staff will provide the temporary storage tank for rinse water generated from decontamination of field equipment and a container for disposable protective clothing.

4.2.1 Septic Wastewater and Rinse Water

After CH2M HILL staff sample the septic tank wastewater (septage) and obtain the analytical results for waste disposal characterization, the PWC crew will pump out the septage from the septic tanks and store it in the temporary storage tank(s). After the contents of the septic tanks be removed, the tanks are be rinsed with a high pressure washer, and the rinse water will be pumped out and placed in the temporary storage tank(s). If the analytical results do not meet the CCCSD special discharge permit requirements, Laidlaw Environmental Services will handle, transport and dispose of the septage at a permitted, authorized waste disposal facility.

4.2.2 Septic Sludge

After CH2M HILL staff sample the nonpumpable sludge in the septic tanks and obtain the analytical results for disposal characterization, the PWC crew will purge the sludge from the septic tanks and store it in the temporary storage container(s). The sludge will then be handled, transported and disposed of at a permitted, authorized waste disposal facility by Laidlaw Environmental Services.

4.2.3 Excavated Soil

Excavated soil will be temporarily stockpiled in the unused parking areas adjacent to the excavation sites, or other nearby areas approved by the NWSC personnel. A layer of plastic sheeting (6-mil minimum) will be placed on the designated stockpiled area before the excavated soil is placed on the sheeting. At the end of each day, an additional layer of plastic sheeting will be placed on top of the stockpile to prevent wind erosion of the stockpiled soil. After the stockpiles are sampled and the analytical results are obtained, PWC will direct Laidlaw Environmental Services to remove, transport, and dispose of the stockpiled soils at a permitted, authorized, offsite, hazardous waste disposal facility. The excavated asphalt concrete materials from SWMU Site 16, if determined to be nonhazardous, will be transported to an asphalt recycling facility when feasible.

4.2.4 Rinse Water From Decontamination of Equipment

Rinse water generated from the decontamination of field equipment will be temporarily stored onsite in a storage tank provided by PWC. The storage tank will be labeled, removed, transported, and disposed of by Laidlaw Environmental Services.

4.2.5 Disposable Protective Clothing

Any protective suits, gloves, and clothing tainted during the construction and site restoration work will be placed in plastic storage bags and deposited in a container provided by PWC. The container will then be removed, transported, and disposed of by Laidlaw Environmental Services.

5. Construction Specifications

Engineering specifications prepared for the construction and site restoration work required for SWMU sites 16 and 40 are described in the following:

Section 01570 Temporary Controls: describes provisions and measures in environmental protections and waste handling complement to Section 4, Environmental Protection and Waste Management Plan. Environmental training documentation required for each field staff is included in Appendix C.

Section 02205 Excavation: provides specifications for conducting excavation work for SWMU 16 and 40.

Section 02220 Fill and Backfill: presents engineering specifications for fill and backfill after excavation work is complete for SWMU 16 and 40.

Section 02521 Concrete Slabs and Sidewalks: provide specifications for the construction of a 8 feet by 8 feet, 8 inches thick, concrete pad reinforced with welded wire fabric for SWMU 40.

Section 02555 Asphalt Concrete Pavement: provides engineering specifications for the construction of a new asphalt concrete pavement to restore SWMU 16.

SECTION 01570

TEMPORARY CONTROLS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910	Occupational Safety and Health Standards
40 CFR 122.26	EPA National Pollutant Discharge Elimination System Permit Regulations
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standard for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials, Tables, and Hazardous Materials Communications Regulations
49 CFR 178	Shipping Container Specification

CORPS OF ENGINEERS (COE)

COE EP 1165-2-304	(1976) Flood Plain Regulations for Flood Plain Management

DISTRICT OF COLUMBIA ENVIRONMENTAL CONTROL DIVISION (DCECD)

DCECD MWR	Title 20, Chapter 40, Municipal Waste Regulation

ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 832-R-92-005	Storm Water Management for Construction Activities

MILITARY SPECIFICATIONS (MIL)

MIL-S-16165	(Rev. E) Shielding Harnesses, Shielding Items and Shielding Enclosures for Use in

	the Reduction of Interference from Engine Electrical Systems

MILITARY STANDARDS (MIL-STD)

MIL-STD-461	(Rev. D) Control and Susceptibility of Electromagnetic Interference
MIL-STD-462	Electromagnetic Interference Characteristics

NORTHERN VIRGINIA DIVISION, STATE AIR POLLUTION CONTROL BOARD (NVDSAPCB)

NVDSAPCB HWMR	Hazardous Waste Management Regulations

WASHINGTON STATE DEPARTMENT OF ECOLOGY (WSDE)

WSDE SMM	Washington State Stormwater Management Manual for the Puget Sound Basin

1.2 Contractor Liabilities for Environmental Protection

Contractors shall complete and provide environmental training documentation for training required by Federal, State, and local regulations (included in Appendix C).

1.3 DEFINITIONS

1.3.1 Sediment

Soil and other debris that have eroded and have been transported by runoff water or wind.

1.3.2 Solid Waste

Rubbish, debris, garbage, and other discarded solid materials, except hazardous waste as defined in paragraph titled "Hazardous Waste," resulting from industrial, commercial, and agricultural operations and from community activities.

1.3.3 Sanitary Wastes

Wastes characterized as domestic sanitary sewage.

1.3.4 Rubbish

Combustible and noncombustible wastes such as paper, boxes, glass, crockery, metal, lumber, cans, and bones.

1.3.5 Debris

Combustible and noncombustible wastes such as ashes and waste materials resulting from construction or maintenance and repair work, leaves, and tree trimmings.

1.3.6 Chemical Wastes

This includes salts, acids, alkalies, herbicides, pesticides, and organic chemicals.

1.3.7 Garbage

Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.3.8 Hazardous Waste

Hazardous substances as defined in 40 CFR 261 or as defined by applicable State and local regulations.

1.3.9 Hazardous Materials

Hazardous materials as defined in 49 CFR 171 and listed in 49 CFR 172.

1.3.10 Landscape Features

Trees, plants, shrubs, and ground cover.

1.3.11 Lead Acid Battery Electrolyte

The electrolyte substance (liquid medium) within a battery cell.

1.3.12 Oily Waste

Petroleum products and bituminous materials.

1.3.13 Class I Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Sections 602 (a and b) of The Clean Air Act.

1.3.14 Industrial Hygienist

An Industrial Hygienist must be certified by the American Board of Industrial Hygiene.

1.4 SUBMITTALS

Submit the following in accordance with Section titled "Submittal Procedures."

1.4.1 SD-08, Statements

a. Environmental protection plan G

1.4.2 SD-18, Records

a. Solid waste disposal permit

b. Disposal permit for hazardous waste G

c. Environmental training documentation G

d. Permit to transport hazardous waste G

e. Hazardous waste certification G

1.4.2.1 Solid Waste Disposal Permit

Submit one copy of a permit or license for the solid waste disposal facility.

1.4.2.2 Disposal Permit for Hazardous Waste

Submit a copy of the applicable EPA and State permits, manifests, or licenses for transportation, treatment, storage, and disposal of hazardous waste by permitted facilities.

1.4.2.3 Permit to Transport Hazardous Waste

Submit one copy of the EPA or State permit license, or regulation for the transporter who will ship the hazardous waste to the permitted Treatment, Storage, and Disposal (TSD) facility.

1.4.2.4 Hazardous Waste Certification

Submit written certification that hazardous waste turned in for disposal was generated on Government property and is identified, packaged, and labeled in accordance with 40 CFR 261, 40 CFR 262, and 40 CFR 263.

1.4.2.5 Erosion and Sediment Control Inspection Reports

Submit to the Contracting Officer once every 7 calendar days and within 24 hours of a storm event that produces 0.5 inch of rain.

1.5 ENVIRONMENTAL PROTECTION REGULATORY REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined in this Section. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, solid waste, and noise pollution.

1.5.1 Environmental Protection Plan

After the award of contract, meet with the Navy personnel to discuss the proposed environmental protection plan and to develop mutual understanding relative to the details of environmental protection, including measures for protecting natural resources, required reports, and other measures to be taken.

a. Include any hazardous materials (HM) planned for use on the station shall be included in the station HM Tracking Program maintained by the Safety Department. To assist this effort, submit a list (including quantities) of HM to be brought to the station and copies of the corresponding material safety data sheets (MSDS). Submit this list to the Contracting Officer. At project completion, remove any hazardous material brought onto the station. Account for the quantity of HM brought to the station, the quantity used or expended during the job, and the leftover quantity which (1) may have additional useful life as a HM and shall be removed by the Contractor, or (2) may be a hazardous waste, which shall then be removed as specified herein.

b. The Environmental Protection Plan shall list and quantify any Hazardous Waste (HW) to be generated during the project.

c. In accordance with station regulations, store HW near the point of generation up to a total quantity of one quart of acutely hazardous waste or 55 gallons of hazardous waste. Move any volume exceeding these quantities to a HW permitted area within 3 days. Prior to generation of HW, contact Contracting Officer for labeling requirements for storage of hazardous wastes.

d. In accordance with station regulations, substitute materials as necessary to reduce the generation of HW and include a statement to that effect in the Environmental Plan.

e. Contact Contracting officer for conditions in the area of the project which may be subject to special environmental procedures. Include this information in the Preconstruction Survey. Describe

in the Environmental Plan any permits required prior to working the area, and contingency plans in case an unexpected environmental condition is discovered.

f. Generate the permits for handling HW, and deliver completed documents to Contracting Officer for review. File the documents with the appropriate agency, and complete disposal with the approval of Contracting Officer. Deliver correspondence with the State concerning the environmental permits and completed permits to Contracting Officer.

1.5.1.1 Environmental Protection Plan Format

The Environmental Protection Plan shall follow the following format:

ENVIRONMENTAL PROTECTION PLAN

Contracting Organization

Address and Phone Numbers

1. Hazardous materials to be brought onto the station
2. MSDS package
3. Employee training documentation
4. HW storage plan
5. HW to be generated
6. Preconstruction survey results
7. Permitting requirements identified

1.5.2 Licenses and Permits

Obtain licenses and permits pursuant to the "Permits and Responsibilities" FAR Clause except for those permits which will be obtained by the Contracting Officer as follows:

a. Special Discharge Permit from CCCSD (by CH2M HILL).

b. Other waste disposal permit(s).

For permits obtained by the Contracting Officer, whether or not required by the permit, perform inspections of the work in progress, and submit certifications to the applicable regulatory agency, via the Contracting Officer, that the work conforms to the contract and permit requirements. The inspections and certifications shall be provided through the services of a Professional Engineer, registered in the State where the work is being performed. As a part of the quality control plan, which is required to be submitted for approval by the quality control section, provide a subitem containing the name, P.E. registration number, address, and telephone number of the professional engineer(s) who will be performing the inspections and certifications for each permit listed above.

1.5.2.1 Licenses, Permits, and Other Responsibilities

Environmental compliance obligations under the Permits and Responsibilities Clause include, but are not limited to, the following:

a. Understand and perform all requirements under Federal, State, interstate, and local environmental laws, regulations and ordinance that are applicable to the work being performed under this Contract. This responsibility extends to securing all permits as required under such laws, regulations, and ordinances.

b. Advising Contractor's agents, employees, and subcontractor's, who will perform operations, activities, or services under this contract of these requirements.

c. Further:

(1) Notify the Government promptly upon receipt of regulatory notices, orders, or requests for information, and promptly supply copies to the Government.

(2) Comply with environmental regulatory notices or orders to the extent attributable to the Contractor's conduct, regardless of whether or not the Contractor is the name recipient of the notice or order.

(3) Correct conditions of environmental noncompliance identified by the Government in the absence of regulatory noncompliance notices. This includes cleaning up any contamination released from contractor operations, whether such contamination is on or off Government property.

d. Upon Government request, provide the Government and any regulatory agency with information that may be required regarding the actual or potential environmental impacts of Contractor's operations. The information shall be timely and complete and in a form acceptable to the Government and/or the regulatory agency.

1.5.3 Class I ODS Prohibition

Class I ODS as defined and identified herein shall not be used in the performance of this contract, nor be provided as part of the equipment. This prohibition shall be considered to prevail over any other provision, specification, drawing, or referenced documents.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work. Confine construction activities to within the limits of the work indicated or specified. [Conform to the [national] [state] permitting requirements of the Clean Water Act.]

3.1.1 Land Resources

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by Contracting Officer. Where such use of attach ropes, cables, or guys is authorized, the Contractor shall be responsible for any resultant damage.

3.1.1.1 Protection

Protect existing trees which are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. By approved excavation, remove trees with 30 percent or more of their root systems destroyed. Removal of trees and the procedure for removal requires approval of the Contracting Officer.

3.1.1.2 Replacement

Remove trees and other landscape features scarred or damaged by equipment operations, and replace with equivalent, undamaged trees and landscape features. Obtain Contracting Officer's approval before removal or replacement.

3.1.2 Fish and Wildlife Resources

Do not disturb fish and wildlife. Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as indicated or specified.

3.1.3 Temporary Construction

Remove traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other signs of construction.

3.2 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Carefully protect in-place and report immediately to the Contracting Officer historical and archaeological items or human skeletal remains discovered in the course of work. Stop work in the immediate area of the discovery until directed by the Contracting Officer to resume work. The Government retains ownership and control over historical and archaeological resources. Contractor shall notify EFA West (RPM and Ms. Patricia Duff at 415/244-3019).

3.3 NOISE

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives will not be permitted without written permission from the Contracting Officer, and then only during designated times.

3.4 RESTRICTIONS ON EQUIPMENT

3.4.1 Electromagnetic Interference Suppression

a. Electric motors must comply with MIL-STD-461 relative to radiated and conducted electromagnetic interference. A test for electromagnetic interference will not be required for motors that are identical physically and electrically to those that have previously met the requirements of MIL-STD-461. An electromagnetic interference suppression test will not be required for electric motors without commutation or sliprings having no more than one starting contact and operated at 3,600 revolutions per minute or less.

b. Equipment used by the Contractor shall comply with MIL-S-16165for internal combustion engines and MIL-STD-461 for other devices capable of producing radiated or conducted interference.

c. Conduct tests for electromagnetic interference on electric motors and Contractor's construction equipment in accordance with MIL-STD-461 and MIL-STD-462. Test location shall be reasonably free from radiated and conducted interference. Furnish testing equipment, instruments, and personnel for making the tests; a test location; and other necessary facilities.

3.4.2 Radio Transmitter Restrictions

Conform to the restrictions and procedures for the use of radio transmitting equipment, as directed. Do not use transmitters without prior

approval.

3.5 EROSION AND SEDIMENT CONTROL MEASURES

3.5.1 Burnoff

Burnoff of the ground cover is not permitted.

3.5.2 Temporary Protection of Erodible Soils

Use the following methods to prevent erosion and control sedimentation:

3.5.2.1 Mechanical Retardation and Control of Runoff

Mechanically retard and control the rate of runoff from the construction site. This includes construction of diversion ditches, benches, berms, and use of silt fences and strawbales to retard and divert runoff to protected drainage courses.

3.5.2.2 Vegetation and Mulch

Provide temporary protection on sides and back slopes as soon as rough grading is completed or sufficient soil is exposed to require erosion protection. Protect slopes by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

a. Provide new seeding where ground is disturbed. Include topsoil or nutriment during the seeding operation necessary to establish a suitable stand of grass.

3.6 CONTROL AND DISPOSAL OF SOLID WASTES

Pick up solid wastes, and place in covered containers which are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean.

3.6.1 Disposal of Solid Waste, Debris, Chemical or Hazardous Substances

Disposal of chemical or hazardous substances at the Base Sanitary Landfill and Hardfill area is prohibited.

3.6.2 Disposal of Rubbish and Debris

Dispose of rubbish and debris in accordance with the requirements specified below:

3.6.2.1 Removal From Government Property

Remove and dispose rubbish and debris from Government property.

3.6.3 Sewage, Odor, and Pest Control

Dispose of sewage according to Special Discharge Permit requirements.

3.6.4 Garbage Disposal

Place garbage in approved containers; the Navy PWC will provide pickup and disposal service.

3.7 CONTROL AND DISPOSAL OF HAZARDOUS WASTE

3.7.1 Hazardous Waste Generation

Handle generated hazardous waste in accordance with 40 CFR 262.

3.7.2 Hazardous Waste Disposal

Dispose of hazardous waste in accordance with Federal, State, and local regulations, especially 40 CFR 263, 40 CFR 264, and 40 CFR 265.

3.7.3 Hazardous Waste Storage

Store hazardous waste in containers in accordance with 49 CFR 178. Identify hazardous waste in accordance with 40 CFR 261 and 40 CFR 262.

3.7.4 Spills of Oil and Hazardous Materials

Take precautions to prevent spills of oil and hazardous material. In the event of a spill, immediately notify the Contracting Officer. Spill response shall be in accordance with 40 CFR 300 and applicable State regulations.

3.8 DUST CONTROL

Keep dust down at all times, including nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not shake bags of cement, concrete mortar, or plaster unnecessarily.

3.9 Construction Laydown Areas

Only designated areas approved by NWSC personnel can be used for equipment laydown and stockpile area. All equipment and stockpiles should be placed at least 10 feet away from any road and at least 20 feet away from any drainage ditch or other water body. Figures 5.1 and 5.2 show the construction laydown areas for SWMU 16 and 40.

– End of Section –

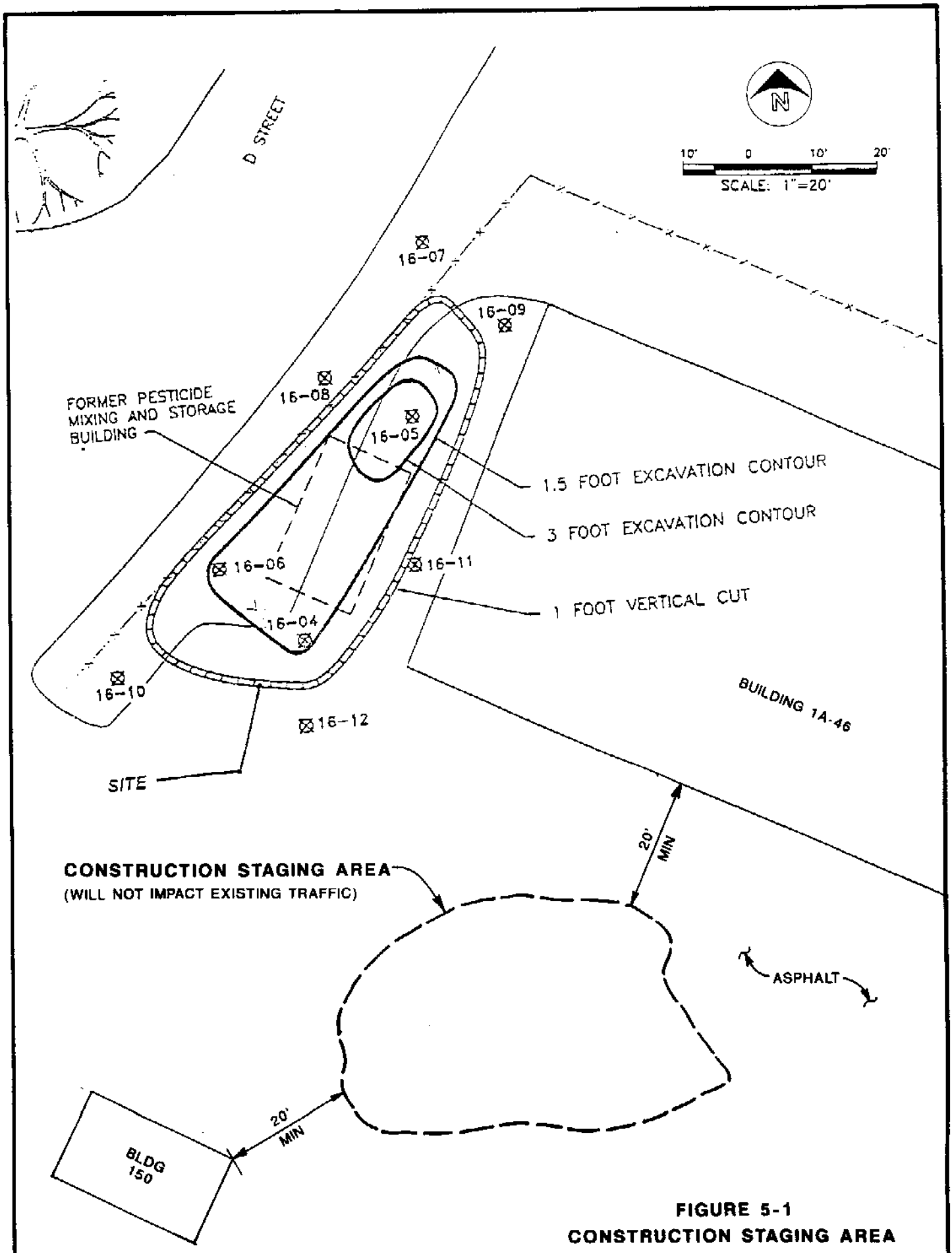


FIGURE 5-1
CONSTRUCTION STAGING AREA
FOR SMWU 16

CH2MHILL

136175.03.WP

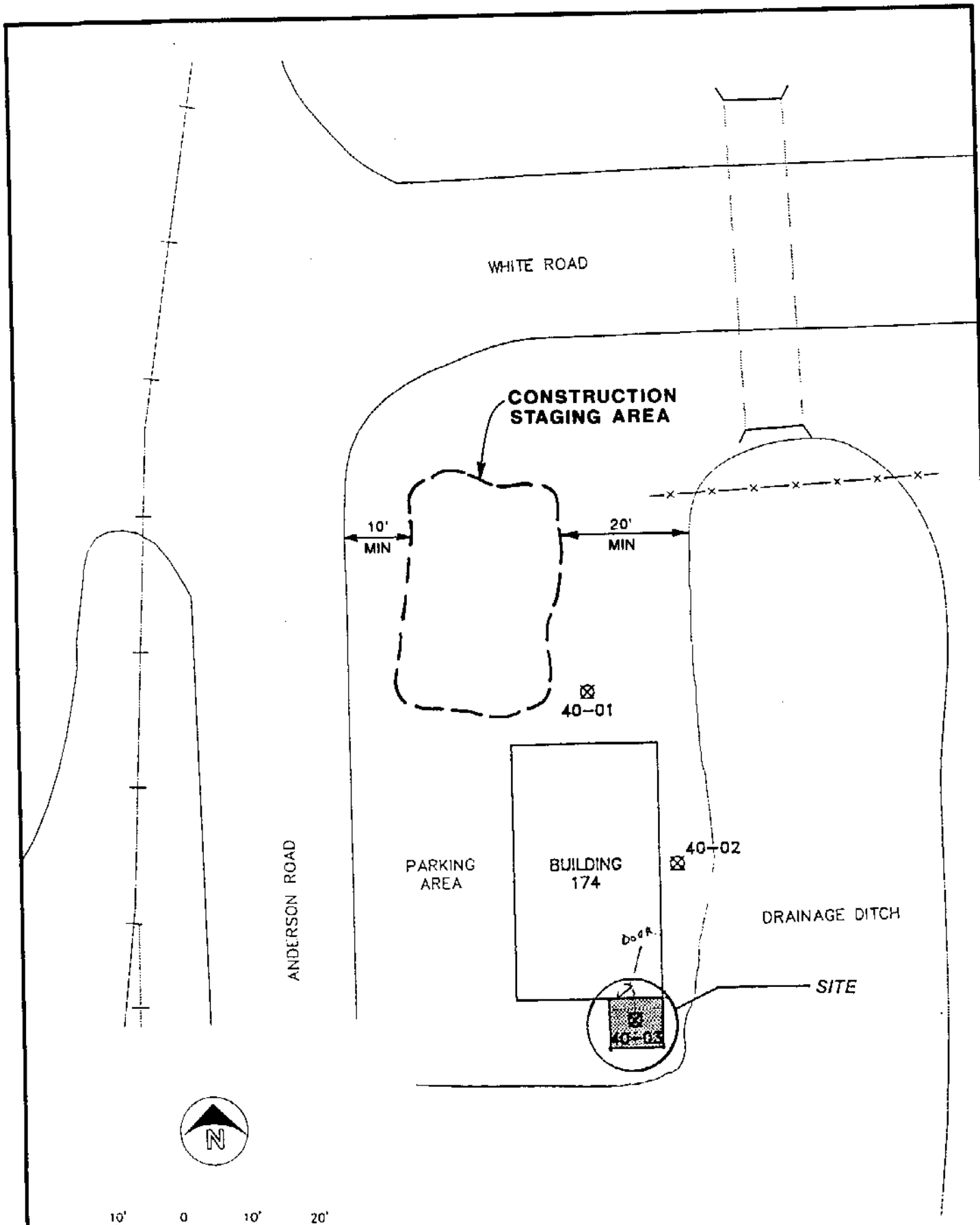


FIGURE 5-2
CONSTRUCTION STAGING AREA
FOR SWMU 40

CH2M HILL

SECTION 02205
EXCAVATION

PART 1 GENERAL

1.1 SUBMITTALS

A. Daily Logs, Field Report, and Shop Drawings:

1. Excavation Plan, Detailing:
   a. Methods and sequencing of excavation.
   b. Proposed locations of stockpiled excavated material.
   c. Proposed onsite and offsite spoil disposal sites.

1.2 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized overexcavation.

1.3 WEATHER LIMITATIONS

A. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

B. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1-foot except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.

B. Do not overexcavate without written authorization of ENGINEER.

C. Remove and dispose of all existing vegetation or shrubs prior to beginning the Work. Protect adjacent vegetation along the drainage ditch at SWMU Site 40 not to be removed from damage.

D. Place silt fence or other sediment control barriers along drainage ditch at SWMU Site 40 to prevent runoff drains into the ditch for water quality control.

E. Remove or protect existing buried utilities as shown or uncovered by the Work.

3.2 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.3 EMBANKMENT AND CUT SLOPES

A. Shape, trim, and finish cut slopes to conform with lines, grades, and cross-sections shown.

B. Remove stones and rock that exceed 3-inch diameter and that are loose and may roll down slope. Remove exposed roots from cut slopes.

3.4 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material for sampling testing. Stockpile excavated asphaltic concrete material and soil material separately at SWMU Site 16.

B. Post signs indicating proposed use of material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable by equipment operators from their normal seated position.

C. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads or streets.

D. Do not stockpile excavated material adjacent to trenches and other excavations unless excavation sideslopes and excavation support systems are designed, constructed, and maintained for stockpile loads.

E. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.

3.5 DISPOSAL OF SPOIL

A. Dispose of excavated material offsite by authorized waste hauler. The method and location of disposal will be dependent on the results of the material testing.

B. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk offsite.

END OF SECTION

SECTION 02220
FILL AND BACKFILL

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
   a. D1557-78, Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-pound (4.54 kg) Rammer and 18-inch (457 mm) Drop.
   b. D4253-83, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
   c. D4254-83, Standard Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

1.2 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D1557-78.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by ENGINEER.

B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Relative Density: Calculated in accordance with ASTM D4254-83 based on maximum index density determined in accordance with ASTM D4253-83 and minimum index density determined in accordance with ASTM D4254-83.

D. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

E. Completed Course: A course or layer that is ready for next layer or next phase of Work.

F. Lift: Loose (uncompacted) layer of material.

G. State Standard Specifications: When referenced in this section, shall mean State of California, Department of Transportation, dated July, 1992.

1.3 SUBMITTALS

A. Quality Control Submittals: Certified test results from independent testing agency for imported fill material.

1.4 QUALITY ASSURANCE

A. Notify ENGINEER when:

1. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
2. Fill material appears to be deviating from Specifications.

PART 2 PRODUCTS

2.1 GRANULAR FILL

A. 3/4-inch Class 2 aggregate base material conforming to Section 26 of the State Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL

A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.

B. Compact the upper 6 inches of the excavated subgrade to minimum of 95 percent Relative Compaction as determined in accordance with ASTM D1557-78.

C. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.

D. Tolerances:

1. Final Lines and Grades: Within a tolerance of 0.1-foot unless dimensions or grades are shown or specified otherwise.
2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.

E. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.2 FILL

A. Outside Influence Areas Beneath Structures, Tanks, Pavements, Curbs, Slabs, Piping, and Other Facilities: Unless otherwise shown, place earthfill as follows:

1. Maximum 8-inch thick lifts.
2. Place and compact fill across full width of embankment.
3. Compact to minimum 95 percent relative compaction as determined in accordance with ASTM D1557-78.

END OF SECTION

SECTION 02521
CONCRETE SLABS AND SIDEWALKS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
   a. A497-90b, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   b. C94-90, Ready Mixed Concrete.
   c. C309-81, Liquid Membrane-Forming Compounds for Curing Concrete.
   d. D994-71, Preformed Expansion Joint Filler for Concrete (Bituminous Type).
2. American Association of State Highway and Transportation Officials (AASHTO): T 99-81, The Moisture-Density Relations of Soils Using a 5.5 pound (2.5 kg) Rammer and a 12-inch (305 mm) Drop.
3. American Concrete Institute (ACI): ACI 304R-89, Guide for Measuring, Mixing, Transporting, and Placing Concrete.

1.2 SUBMITTALS

A. Shop Drawings:

1. Complete data on concrete mix, including aggregate gradations and admixtures in accordance with requirements of ASTM C94-90.
2. Reinforcing steel in accordance with CRSI 1990 Manual of Standard Practice and ACI SP-66.

B. Quality Control Submittals:

1. Curing Compound: Manufacturer's Certificate of Compliance and application instructions.
2. Ready-mix delivery ticket for each truck in accordance with ASTM C94-90.

PART 2 PRODUCTS

2.1 CONCRETE

A. Ready-mixed meeting ASTM C94-90, Option A, with compressive strength of 3,000 psi at 28 days.

B. Maximum Aggregate Size: 1-1/2-inch.

C. Slump: 2 to 4 inches.

2.2 CURING COMPOUND

A. Liquid membrane-forming, clear or translucent, suitable for spray application and meeting ASTM C309-81, Type 1.

2.3 REINFORCING STEEL

A. Welded Wire Fabric: ASTM A497-90b.

PART 3 EXECUTION

3.1 FORMWORK

A. Lumber Materials:

1. 2-inch dressed dimension lumber, or metal of equal strength, straight, free from defects that would impair appearance or structural quality of completed slab or sidewalk.
2. 1-inch dressed lumber or plywood may be used where short-radius forms are required.

B. Metals: Steel in new undamaged condition.

C. Setting Forms:

1. Construct forms to shape, lines, grades, and dimensions.
2. Stake securely in place.

D. Bracing:

1. Brace forms to prevent change of shape or movement resulting from placement.
2. Construct short-radius curved forms to exact radius.

E. Tolerances:

1. Do not vary tops of forms from gradeline more than 1/8-inch when checked with 10-foot straightedge.
2. Do not vary alignment of straight sections more than 1/8-inch in 10 feet.

3.2 PLACING REINFORCING STEEL

A. Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended Practice for Placing Reinforcing Bars.

3.3 PLACING CONCRETE

A. Prior to placing concrete, remove water from excavation and debris and foreign material from forms.

B. Place concrete as soon as possible, and within 1-1/2 hours after adding cement to mix without segregation or loss of ingredients, and without splashing.

C. Place, process, finish, and cure concrete in accordance with applicable requirements of ACI 304-89, and this section. Wherever requirements differ, the more stringent shall govern.

D. To compact, vibrate until concrete becomes uniformly plastic.

3.4 SLAB AND SIDEWALK CONSTRUCTION

A. Thickness: 8 inches and as shown on the Drawings.

B. Slab should be placed 4 inches above surrounding gravel ground cover.

C. Finish:

1. Broom surface with fine-hair broom at right angles to length of walk and tool at edges, joints, and markings.
2. Apply curing compound to exposed surfaces upon completion of finishing.
3. Protect slab sidewalk from damage and allow to cure for at least 7 days.

END OF SECTION

SECTION 02555
ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 DEFINITIONS

A. Combined Aggregate: All mineral constituents of an asphalt concrete mix, including mineral filler and separately sized aggregates.

B. State Standard Specifications: When referenced in this section, shall mean State of California, Department of Transportation, dated July, 1992.

1.2 SUBMITTALS

A. Quality Control Submittals:

1. Manufacturer's Certificate of Compliance for the following materials:
   a. Aggregate: Gradation.
   b. Asphalt for Binder: Type and grade.
   c. Prime Coat: Type and grade of asphalt.
   d. Tack Coat: Type and grade of asphalt.
   e. Mixes: Conforms to job-mix formula.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Temperature:

1. Do not apply asphalt materials or place asphalt mixes when ground temperature is lower than 50 degrees F, air temperature is lower than 40 degrees F, or application surface is wet.
2. Measure ground and air temperature in shaded areas away from heat sources or wet surfaces.

PART 2 PRODUCTS

2.1 PRIME COAT

A. Liquid asphalt, Grade SC-70, conforming to Section 93 of State Standard Specifications.

2.2 TACK COAT

A. Emulsified asphalt, Grade SS1, conforming to Section 94 of State Standard Specifications.

2.3 ASPHALT CONCRETE MIXTURE

A. Asphalt Concrete: Type B, as specified in Section 39.2 of State Standard Specifications.

B. Asphalt cement shall be AR-4000 paving asphalt as specified in Section 92 of State Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL

A. Application Equipment: In accordance with Section 39 of State Standard Specifications.

3.2 CONTROL OF LINE AND GRADE

A. Provide and maintain intermediate control, independent of the underlying base to meet finish surface grades and minimum thickness.

3.3 PRIME COAT

A. Do not apply when moisture content of upper 3 inches of base exceeds optimum moisture content of base, or if free moisture is present.

B. Application: Apply prime coat uniformly to base. Avoid overlapping of applications. Touch up missed or lightly coated surfaces. Remove or redistribute excess material.

C. Application Rate: Minimum 0.15 to maximum 0.40 gallons per square yard of surface area.

D. Maintenance:

1. Sweep primed surface until free of dirt, dust, or other foreign matter immediately before placing asphalt concrete.
2. Blot excess prime material with an approved clean sand prior to paving.
3. Patch holes in primed surface with asphalt concrete before placing asphalt concrete.

3.4 TACK COAT

A. Do not apply more tack coat than necessary for the day's paving operation.

B. Application: Apply tack coat uniformly to clean dry surfaces. Avoid overlapping of applications. Touch up missed or lightly coated surfaces and remove excess tack coat.

C. Application Rate: Minimum 0.05-gallon to maximum 0.15-gallon of asphalt (residual if diluted emulsified asphalt) per square yard of surface area. Apply at rate, within range specified, sufficient to assure good bonding, but not too heavy that surplus asphalt flushes into asphalt concrete being placed.

3.5 ASPHALT CONCRETE PAVEMENT PLACEMENT

A. Lay asphalt concrete over prepared base in maximum 3-inch lifts. For pavement thickness greater than 3 inches, use multiple lifts.

B. Collect and dispose of segregated aggregate from raking process. Do not scatter material over finished surface.

3.6 CONNECTIONS WITH EXISTING FACILITIES

A. Where asphalt concrete pavement connects to an existing roadway surface, or other facility, modify existing roadway profile to produce a smooth riding connection to existing facility.

B. Paint edges of contact surfaces (curbs, manhole frames), before laying pavement, with tack coat or paving asphalt cement to provide watertight joints. Do not stain adjacent surfaces not intended to be coated.

3.7 SPREADING AND COMPACTING

A. Conform to requirements of Section 39 of State Standard Specifications.

3.8 JOINTS

A. Offset edge of each layer a minimum of 6 inches so joints shall not be directly over those in underlying layer.

B. Form transverse joints by cutting back on previous day's run to expose full vertical depth of layer.

3.9 JOINT COMPACTION

A. Place top or wearing layer as continuously as possible.

B. Pass roller over unprotected end of freshly laid mixture only when laying of layer is discontinued long enough to permit mixture to become chilled.

C. Cut back previously compacted mixture when Work is resumed to produce a slightly beveled edge for full thickness of layer.

D. Cut away waste material and lay new mix against fresh cut.

3.10 TOLERANCES

A. Conduct measurements for conformity with crown and grade immediately after initial compression. Correct variations immediately by removal or addition of materials and by continuous rolling.

B. Tolerance Measurements:

1. Completed Surface of Top or Wearing Layer: Uniform texture, smooth, and uniform to crown and grade.
2. Completed surface shall not vary more than 1/8-inch from lower edge of 10-foot straightedge placed on surface parallel to centerline.
3. Transverse slope of completed surface shall not vary more than 1/4-inch in 10 feet from the rate of transverse slope shown.
4. Finished grade shall not vary more than 0.02 feet.

C. Correct deviations in excess of specified tolerances by addition of asphalt concrete mixture to low places or removal of material from high places.

D. Wearing surface may be removed and replaced to achieve a satisfactory finish surface, if surface of completed pavement deviates by more than twice the specified tolerances.

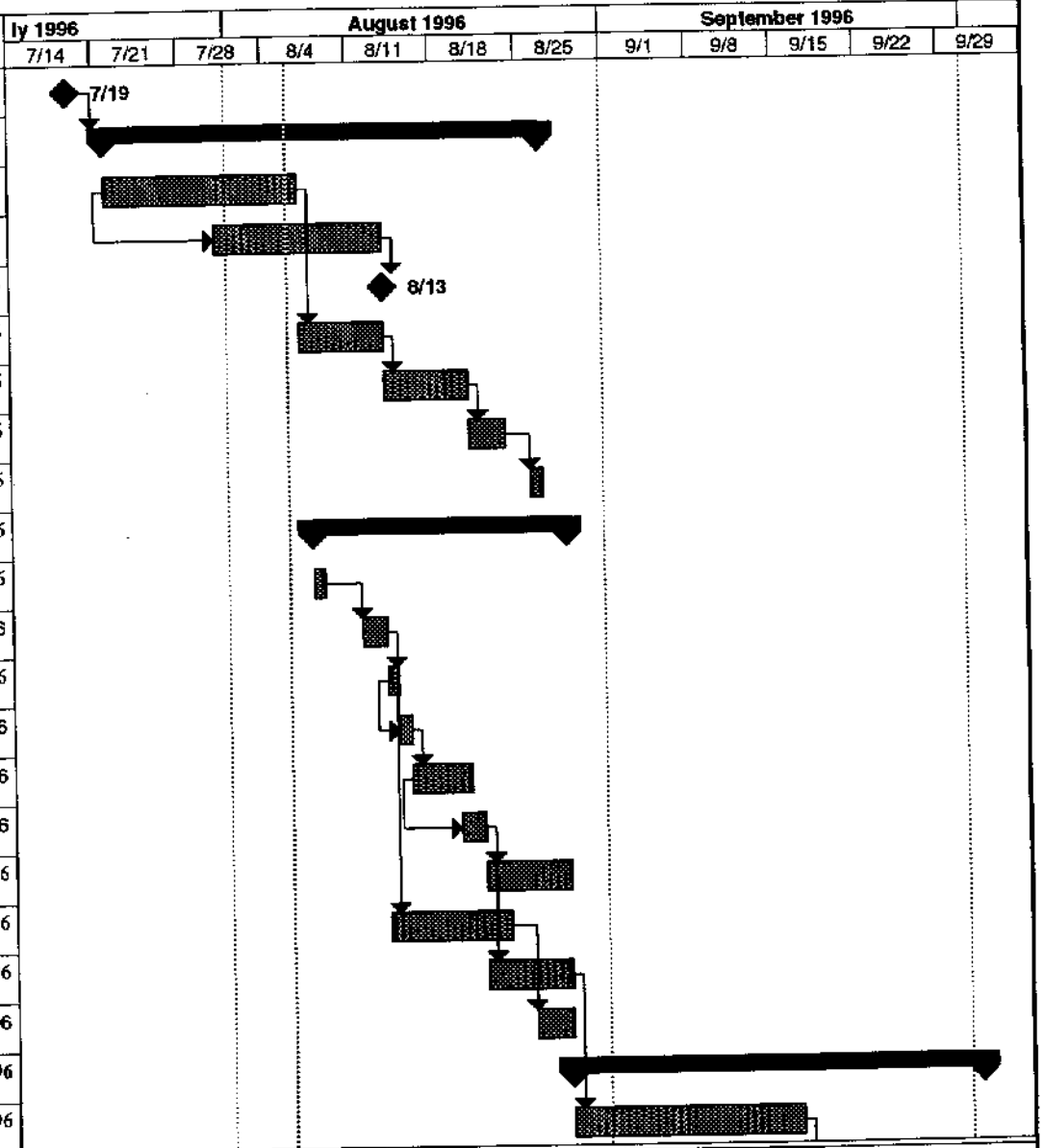
END OF SECTION

6. Schedule

A project schedule for all planned activities for this project is shown in the following pages.

PROJECT SCHEDULE FOR RCRA CORRECTIVE ACTION OF SWMU SITES 13, 16, AND 40 AT NWS, CONCORD

ID	Task Name	Duration	Start	Finish
1	**Notice-To-Proceed**	0d	7/19/96	7/19/96
2	**Work Plan/HSP/SAP/QCP**	26d	7/22/96	8/26/96
3	First Draft	12d	7/22/96	8/6/96
4	WW Discharge Permit Applicati	10d	7/31/96	8/13/96
5	WW Discharge Permit	0d	8/13/96	8/13/96
6	Document Review by Navy	5d	8/7/96	8/13/96
7	Final WP Preparation	5d	8/14/96	8/20/96
8	Navy Review Final Rpt	3d	8/21/96	8/23/96
9	Navy Approves Final WP	1d	8/26/96	8/26/96
10	**Field Constr./Restor. Program**	15d	8/8/96	8/28/96
11	Demo. Conference w/ ROICC	1d	8/8/96	8/8/96
12	Septic Tank Sampling	2d	8/12/96	8/13/96
13	Excavation Work for Site 40	1d	8/14/96	8/14/96
14	Field Sampling at Site 40	1d	8/15/96	8/15/96
15	Excavation Work for Site 16	3d	8/16/96	8/20/96
16	Field Sampling at Site 16	2d	8/20/96	8/21/96
17	Restoration Work for Sites 16/40	5d	8/22/96	8/28/96
18	Septic Tank Sampling Results	8d	8/14/96	8/23/96
19	Confirmation Sampling Results	5d	8/22/96	8/28/96
20	Septic Tank Cleaning/Sampling	3d	8/26/96	8/28/96
21	**Closure/Summary Report**	23d	8/29/96	10/1/96
22	First draft	12d	8/29/96	9/16/96



Project: 136175
Date: 8/6/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

8/6/96 10:31 AM

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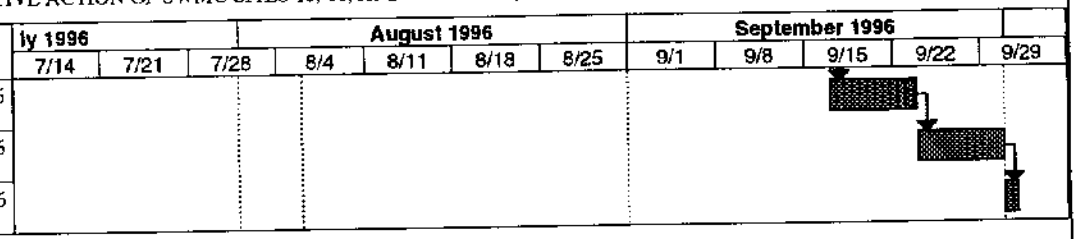
PROJECT SCHEDULE FOR RCRA CORRECTIVE ACTION OF SWMU SITES 13, 16, AND 40 AT NWS, CONCORD

ID	Task Name	Duration	Start	Finish
23	Navy Review First Draft	5d	9/17/96	9/23/96
24	Final Plan Preparation	5d	9/24/96	9/30/96
25	Final Report/Submit to Agencies	1d	10/1/96	10/1/96



Project: 136175
Date: 8/6/96

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

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7. References

Naval Facilities Engineering Command-Engineering Field Activity West (EFA West). Resource Conservation Recovery Act Corrective Action Work Plan for Solid Waste Management Units 13, 16, and 40 at Naval Weapons Station Concord. April 15, 1996.

U.S. Environmental Protection Agency. EPA Design Manual: Onsite Wastewater Treatment and Disposal Systems - Septic Tank, Operation, and Maintenance. 1980

U.S. Environmental Protection Agency. Design Manual: Onsite Wastewater Treatment and Disposal System. 1990.

Appendix A

Table A
Reporting Limits of Organic Pollutants in Water

Method 608/8080 by GC/MS

Analyte	Reporting Limit µg/l
Aldrin	0.04
a-BHC	0.03
b-BHC	0.05
g-BHC	0.04
d-BHC	0.05
4,4'-DDD	0.10
4,4'-DDE	0.04
4,4'-DDT	0.10
Dieldrin	0.02
Endosulfan I	0.05
Endosulfan II	0.04
Endosulfan Sulfate	0.10
Endrin	0.06
Endrin Ketone	0.10
Heptachlor	0.03
Heptachlor Epoxide	0.05
4,4'-Methoxychlor	0.50
Toxaphene	1.0
PCB 1016	0.5
PCB 1221	0.5
PCB 1232	0.5
PCB 1242	0.5
PCB 1248	0.5
PCB 1254	1.0
PCB 1260	1.0
Technical Chlordane	0.05

Table A
Reporting Limits of Organic Pollutants in Water

Method 624/8240 by GC/MS

Analyte	Reporting Limit µg/l
Chloromethane	10
Bromomethane	10
Vinyl Chloride	10
Chloroethane	10
Methylene chloride	5
Acetone	10
Carbon disulfide	5
1,1-Dichloroethene	5
1,1-Dichloroethane	5
1,2-Dichloroethene (Total)	5
Chloroform	5
1,2-Dichloroethane	5
2-Butanone	10
1,1,1-Trichloroethane	5
Carbon Tetrachloride	5
Vinyl Acetate	10
Bromodichloromethane	5
1,2-Dichloropropane	5
cis-1,3-Dichloropropene	5
Trichloroethene	5
Dibromochloromethane	5
1,1,2-Trichloroethane	5
Benzene	5
Trans-1,3-Dichloropropene	5
Bromoform	5
2-Hexanone	10
4-Methyl-2-pentanone	10
Tetrachloroethene	5
1,1,2,2-Tetrachloroethane	5
Toluene	5
Chlorobenzene	5
Ethylbenzene	5
Styrene	5
Xylene (Total)	5

Table A
Reporting Limits of Organic Pollutants in Water

Method 625/8270 by GC/MS

Analyte	Reporting Limit µg/l
Phenol	10
bis(2-Chloroethyl)ether	10
2-Chlorophenol	10
1,3-Dichlorobenzene	10
1,4-Dichlorobenzene	10
Benzyl alcohol	10
1,2-Dichlorobenzene	10
2-Methylphenol	10
bis(2-Chloroisopropyl)ether	10
4-Methylphenol	10
N-Nitroso-di-n-propylamine	10
Hexachloroethane	10
Nitrobenzene	10
Isophorone	10
2-Nitrophenol	10
2,4-Dimethylphenol	10
Benzoic acid	50
bis(2-Chloroethoxy)methane	10
2,4-Dichlorophenol	10
1,2,4-Trichlorobenzene	10
Naphthalene	10
4-Chloroaniline	10
Hexachlorobutadiene	10
4-chloro-3-methylphenol	10
2-Methylnaphthalene	10
Hexachlorocyclopentadiene	10
2,4,6-Trichlorophenol	10
2,4,5-Trichlorophenol	50
2-Chloronaphthalene	10
2-Nitroaniline	50
Dimethylphthalate	10
Acenaphthylene	10
2,6-Dinitrotoluene	10

Table A
Reporting Limits of Organic Pollutants in Water

Analyte	Reporting Limit µg/l
3-Nitroaniline	50
Acenaphthene	10
2,4-Dinitrophenol	50
4-Nitrophenol	50
Dibenzofuran	10
2,4-Dinitrotoluene	10
Diethylphthalate	10
4-Chlorophenyl-Phenylether	10
Flourene	10
4-Nitroaniline	50
4,6-Dinitro-2-methylphenol	50
N-Nitrosodiphenylamine	10
4-Bromophenyl-Phenylether	10
Hexachlorobenzene	10
Pentachlorophenol	50
Phenanthrene	10
Anthracene	10
Di-n-butylphthalate	10
Fluoranthene	10
Pyrene	10
Butylbenzylphthalate	10
3,3'-Dichlorobenzidine	20
Benzo(a)anthracene	10
Chrysene	10
bis(2-Ethylhexyl)phthalate	10
Di-n-octylphthalate	10
Benzo(b)fluoranthene	10
Benzo(k)fluoranthene	10
Benzo(a)pyrene	10
Ideno(1,2,3-cd)pyrene	10
Dibenzo(a,h)anthracene	10
Benzo(g,h,i)perylene	10

Table B
Quality Assurance Targets for Water

Method 608

Parameter	Precision[a] (% RSD)	Accuracy[b] (% Recovery)
a-BHC	0 to 5	84 to 110
b-BHC	0 to 5	83 to 108
g-BHC	0 to 4	85 to 107
d-BHC	0 to 4	87 to 107
Heptachlor	0 to 5	86 to 116
Aldrin	0 to 4	88 to 110
Heptachlor epoxide	0 to 4	89 to 109
Endosulfan I	0 to 2	90 to 107
Dieldrin	0 to 5	86 to 114
4,4-DDE	0 to 3	90 to 106
Endrin	0 to 6	77 to 112
Endosulfan II	0 to 6	82 to 118
4,4-DDD	0 to 4	88 to 110
Endrin aldehyde	0 to 5	81 to 108
Endosulfan sulfate	0 to 4	86 to 109
4,4-DDT	0 to 6	78 to 111
Methoxychlor	0 to 6	80 to 110
Toxaphene	0 to 12	32 to 62
PCB-1221	0 to 10	28 to 52
PCB-1248	0 to 14	65 to 159
PCB-1260	0 to 12	64 to 130
Chlordane (Technical)	0 to 15	52 to 130

Table B
Quality Assurance Targets for Water
Method 624

Parameter	Precision[a] (% RSD)	Accuracy[b] (% Recovery)
Bromomethane	0 to 7	81 to 119
Vinyl chloride	0 to 20	37 to 157
Chloroethane	0 to 11	69 to 132
Methylene chloride	0 to 11	69 to 134
Acetone	0 to 30	14 to 200
Carbon disulfide	0 to 4	88 to 113
1,1-Dichloroethene	0 to 3	92 to 108
1,1-Dichloroethane	0 to 4	91/112
trans-1,2-Dichloroethene	0 to 2	95 to 106
Chloroform	0 to 3	91 to 111
1,2-Dichloroethane	0 to 3	91 to 111
2-Butanone	0 to 19	49 to 171
1,1,1-Trichloroethane	0 to 6	84 to 119
Carbon tetrachloride	0 to 6	84 to 121
Vinyl acetate	0 to 7	83 to 125
Bromodichloromethane	0 to 6	84 to 121
1,2-Dichloropropane	0 to 5	88 to 118
trans-1,3-Dichloropropene	0 to 6	84 to 121
Trichloroethene	0 to 5	88 to 116
Dibromochloromethane	0 to 6	84 to 119
1,1,2-Trichloroethane	0 to 6	85 to 120
Benzene	0 to 5	88 to 117
cis-1,3-Dichloropropene	0 to 5	86 to 117
2-Chloroethyl vinyl ether	0 to 7	84 to 123
Bromoform	0 to 8	79 to 124
4-Methyl-2-pentanone	0 to 11	71 to 141
2-Hexanone	0 to 14	63 to 152
1,1,2,2-Tetrachloroethane	0 to 8	80 to 126
Tetrachloroethene	0 to 6	85 to 116
Toluene	0 to 5	86 to 116
Chlorobenzene	0 to 6	85 to 118
Ethylbenzene	0 to 5	86 to 116
Styrene	0 to 6	84 to 119
Total xylenes	0 to 5	88 to 114

Table B
Quality Assurance Targets for Water

Method 625

Parameter	Precision[a] (% RSD)	Accuracy[b] (% Recovery)
n-Nitrosodimethylamine	0 to 10	70 to 127
Phenol	0 to 8	75 to 125
Aniline	0 to 9	70 to 123
bis(2-Chloroethyl)ether	0 to 7	78 to 119
2-Chlorophenol	0 to 3	89 to 109
1,3-Dichlorobenzene	0 to 2	94 to 104
1,4-Dichlorobenzene	0 to 4	90 to 111
Benzyl alcohol	0 to 5	84 to 114
1,2-Dichlorbenzene	0 to 3	91 to 108
2-methylphenol	0 to 6	81 to 117
bis(2-Chloroisopropyl)ether	0 to 14	58 to 139
4-methylphenol	0 to 6	82 to 117
n-Nitroso-di-n-propylamine	0 to 10	67 to 128
Hexachloroethane	0 to 2	92 to 106
Nitrobenzene	0 to 8	74 to 124
Isophorone	0 to 7	78 to 119
2-Nitrophenol	0 to 5	85 to 115
2,4-Dimethylphenol	0 to 3	90 to 107
Benzoic acid	0 to 13	62 to 140
bis-(2-Chloroethoxy)methane	0 to 4	86 to 113
2,4-Dichlorophenol	0 to 3	90 to 110
1,2,4-Trichlorobenzene	0 to 5	86 to 114
Naphthalene	0 to 3	93 to 108
4-Chloroaniline	0 to 3	89 to 110
Hexachlorobutadiene	0 to 6	84 to 117
4-Chloro-3-methylphenol	0 to 5	84 to 112
2-Methylnaphthalene	0 to 4	87 to 114
Hexachlorocyclopentadiene	0 to 11	67 to 134
2,4,6-Trichlorophenol	0 to 7	78 to 120
2,4,5-Trichlorophenol	0 to 9	73 to 125
2-Chloronaphthalene	0 to 4	87 to 113

Table B
Quality Assurance Targets for Water

Parameter	Precision[a] (% RSD)	Accuracy[b] (% Recovery)
2-Nitroaniline	0 to 9	69 to 124
Dimethyl phthalate	0 to 5	83 to 115
Acenapthtylene	0 to 3	90 to 111
3-Nitroaniline	0 to 8	74 to 120
Acenaphthene	0 to 3	90 to 110
2,4-Dinitrophenol	0 to 17	49 to 150
4-Nitrophenol	0 to 19	41 to 154
Dibenzofuran	0 to 4	87 to 112
2,4-Dinitrotoluene	0 to 6	79 to 116
2,6-Dinitrotoluene	0 to 5	86 to 114
Diethyl phthalate	0 to 4	85 to 110
4-Chlorophenyl phenyl ether	0 to 6	80 to 118
Fluorene	0 to 4	88 to 112
4-Nitroaniline	0 to 11	68 to 133
4,6-Dinitro-2-methylphenol	0 to 8	76 to 124
n-Nitrosodiphenylamine	0 to 5	86 to 117
4-Bromophenyl phenyl ether	0 to 4	87 to 113
Hexachlorobenzene	0 to 7	82 to 121
Pentachlorophenol	0 to 17	52 to 151
Phenanthrene	0 to 5	88 to 115
Anthracene	0 to 6	84 to 120
Di-n-butyl phthalate	0 to 7	82 to 122
Fluoranthene	0 to 11	71 to 139
Benzidine	0 to 33	0 to 191
Pyrene	0 to 14	56 to 143
Butyl benzyl phthalate	0 to 15	55 to 146
3,3-Dichlorobenzidine	0 to 7	81 to 121
Benzo(a)anthracene	0 to 6	83 to 120
bis(2-Ethylhexyl)phthalate	0 to 12	64 to 138
Chrysene	0 to 5	84 to 117
Di-n-octyl phthalate	0 to 20	41 to 164

Table B
Quality Assurance Targets for Water

Parameter	Precision[a] (% RSD)	Accuracy[b] (% Recovery)
Benzo(b)fluoranthene	0 to 15	55 to 144
Benzo(k)fluoranthene	0 to 11	71 to 139
Benzo(a)pyrene	0 to 13	63 to 141
Indeno(1,2,3-cd)pyrene	0 to 10	73 to 131
Dibenzo(a,h)anthracene	0 to 9	73 to 128
Benzo(ghi)perylene	0 to 12	67 to 136

Table C

Quality Assurance Targets for Soil, Sediment, and Waste

Method/Extraction 8080/3550

Parameter	Precision '(% RSD)	Accuracy (% Recovery)
a-BHC	+/-50%	37 to 134[d]
b-BHC	+/-50%	17 to 147[d]
g-BHC	+/-50%	32 to 127[d]
d-BHC	+/-50%	19 to 140[d]
Heptachlor	+/-50%	34 to 111[d]
Aldrin	+/-50%	42 to 122[d]
Heptachlor epoxide	+/-50%	37 to 142[d]
Endosulfan I	+/-50%	45 to 153[d]
Dieldrin	+/-50%	36 to 146[d]
4,4-DDE	+/-50%	30 to 145[d]
Endrin	+/-50%	30 to 147[d]
Endosulfan II	+/-50%	D to 202[d]
4,4-DDD	+/-50%	31 to 141[d]
Endosulfan sulfate	+/-50%	26 to 144[d]
4,4-DDT	+/-50%	25 to 160[d]
Methoxychlor	+/-50%	ID
Toxaphene	+/-50%	41 to 126[d]
Chlordane, Technical	+/-50%	45 to 119[d]
PCB-1016	+/-50%	50 to 114[d]
PCB-1221	+/-50%	15 to 178[d]
PCB-1232	+/-50%	10 to 215[d]
PCB-1242	+/-50%	39 to 150[d]
PCB-1248	+/-50%	38 to 158[d]
PCB-1254	+/-50%	29 to 131[d]
PCB-1260	+/-50%	8 to 127[d]

Appendix B

MEMORANDUM CH2M HILL

TO: Meeting Attendance

COPIES: Roger Soohoo/EFA West Ron Reiland/CH2M HILL

Dave Kinney/CH2M HILL Marty Medina/CH2M HILL

FROM: Winifred Au and Claudia Cornejo/CH2M HILL

DATE: July 29, 1996

SUBJECT: RCRA Corrective Action of SWMU Sites 13, 16 and 40 and Eight Other Septic Tanks at Naval Weapons Station Concord - Meeting Minutes for the Kickoff Meeting

PROJECT: 136175.03.MT

A kickoff meeting was held at the Naval Weapons Station Concord (NWSC) on July 22, 1996 to discuss the issues related the above-referenced project. A project schedule and an agenda were prepared by Winifred Au and distributed in the meeting. The meeting was held in the morning from 9:00 a.m. to about 11:00 a.m. The attendance sheet is attached. After the meeting, the Navy Public Works (PWCSFB) staff and CH2M HILL staff visited each of the project sites, except for SWMU Site 44. This memo summarizes the keynotes of the meeting and data gathered during the site visit.

Keynotes of the Kickoff Meeting

Most of the site information gathered during the kickoff meeting was provided by Richard Piper and Stan Heller of the base.

1. For this project, Richard Piper will be the point of contact at the NWSC, Pete Zucca will be the project manager, David Kimes will be the EIC, Harold Kailhiwa will be the construction foreman, and Tony Alig is the environmental planner and cost estimator from PWCSFB. Laidlaw Environmental will be the hazardous waste hauler.

2. Septic tanks were installed mostly in the 1940s, with capacities of 2,000 to 3,000 gallons (with the exception of tanks that serve Buildings IA-87 and IA-350, which were installed in the 1950s). All of the tanks have never been cleaned since their inceptions. Samples were collected from the tanks in 1993 and 1995. Richard Pieper provided copies of these analytical results, and also provided reports with historical and current building uses associated with each of the septic tanks. Construction drawings were also provided on some of the tanks, and site maps for all of the project sites.

3. The only known underground utility at SWMU Site 16 is a water line. The PWC crew will be responsible for locating all utilities within the project area prior to the field work. Some bushes are located along the existing 6-foot fence on the western border. These

bushes will be cleared and will have no need to be replaced. The impacted area will be resurfaced with 3-inch asphaltic concrete for light traffic use. Harold Kailhiwa indicated that PWC will attempt to preserve the existing 6-foot fence during construction and would not need to take a section down and replace it. Richard Pieper indicated that the existing asphalt pavement could be contaminated with DDT. The asphaltic concrete excavated during site restoration will be stockpiled separately from the excavated soil for testing.

4. SWMU Site 40 is located in the Tidal Area. Tony Alig would like to increase the thickness of the concrete pad from 4 to 6 inches, and would like 4 inches above the surrounding gravel cover. This concrete pad will be placed at the entrance of Building IA-174 as a passenger walkway, which should slope towards Anderson Road away from the building toward the drainage ditch, at 0.02% grade. This area may have some PCB contamination.

5. The site safety issues for this project include overhead high voltage lines, railroad lines, and roadways adjacent to the project sites. There are no radiological and chemical hazards in the sites (except the constituents of concern detected at various sites from previous site investigation work). The possible biological hazards are snakes and bees.

6. Generally, there is no special access requirements for performing site work for this project, except Building 350. Building 350 is a former high security area, and requires an advance arrangement to obtain access to the septic tank location.

7. The base can provide a 30 days pass for the project team, which Richard Pieper will coordinate. In the first day of field work, the crew should not arrive earlier than 7:30 a.m., since the base's normal operation hours are from 7:30 a.m. to 4:00 p.m., and passes need to be obtained. The team can generally begin working earlier than 7:30 a.m., with the exception of the first day.

Visits to the Eleven Project Sites

1. SWMU Site 16 -- PWCSFB staff confirmed that it is possible not to disturb the 6-foot fence during excavation and site restoration work. The existing drainage of the impacted area flowing westerly toward the street and the new pavement will retain this drainage condition. There are large empty paved parking areas in front of Building IA-46 and can be used for equipment laydown and as stockpile areas. PWC staff will check with the base to get a permission to use this area.

2. SWMU Site 40 -- There is a drainage ditch close to the eastern and southern borders of the project site. The banks of the drainage ditch is heavily vegetated. If the concrete pad is placed 4 inches elevated from the surrounding gravel cover, no sloping of the pad is

required for drainage. Some of the site safety concern is the high voltage equipment and overhead lines at the project vicinity.

3. Septic Tanks at SWMU Sites 12, 13, 14, 17, 20, 23, 24, 44, and 54 -- PWC and CH2M HILL staff visited all of the septic tank sites, except at SWMU 44 where Building 350 was not accessible at the time of the visit. Most of the septic tanks are buried and covered with soil, except tanks at SWMU Sites 12 & 20, and 24. Access to these tanks will require digging the soils several feet deep. At SWMU Sites 14 and 23 clearing of vegetation will be required.

Action Items

After the kickoff meeting the following action items are required prior to mobilization of field work.

1. Confirm equipment laydown and stockpile areas allowed by the base.

2. Determine if garbage generated during construction can be allowed to be disposed of at the base domestic garbage cans.

3. Obtain a 30 days pass for all field crew, and arrange access to Building 350 after schedule is confirmed.

4. Determine cellular phone restrictions.

5. Obtain special camera pass.

RCRA Corrective Action of SWMU 13, 16, and 40

July 22, 1996

Winifred Au	CH2M Hill	(510) 251-2888 ext. 21
David Kimes	PWC	(510) 302-5420
CHRIS DAY	PWC	(510) 302-3394
PETE ZUREA	PWC	(510) 302-4257
TONY ALIG	PWC PTE	510-302-4271
HAROLD KAILIHIWA	PWC	510-302-3079
Richard Pieper	WPNSTA Concord	(510) 246-5650
Stan Keller	" "	510-246-5672
Claudia Cornejo	~~PWC~~ CH2M HILL	510-251-2888 x2023

Appendix C

CAL ENVIRONMENTAL SERVICES INC

This is to certify that

Jerry Gibson

has successfully completed 8 hours of formal training entitled

Hazwoper 8 hr. Refresher

5/2/96 to 5/2/96
Course Date(s)

5/2/96
Exam Date

5/2/97
Expiration Date

Authorized CAL INC Signature

AC-12936
Certificate Number

CAL INC. PO Box 6327 Vacaville, CA 95696 707-446-7996

CAL ENVIRONMENTAL **SERVICES INC**

This is to certify that

Larry Kelley

has successfully completed 8 hours of formal training entitled

Hazwoper 8 hr. Refresher

5/7/96 to 5/7/96	5/7/96	5/7/97
Course Date(s)	Exam Date	Expiration Date

Authorized CAL INC Signature

AC-12954
Certificate Number

CAL INC. PO Box 6327 Vacaville, CA 95696 707-446-7996

CAL ENVIRONMENTAL SERVICES INC

This is to certify that

Daniel Letts

has successfully completed 8 hours of formal training entitled

Hazwoper 8 hr. Refresher

5/9/96 to 5/9/96 Course Date(s)	5/9/96 Exam Date	5/9/97 Expiration Date

Authorized CAL INC Signature

AC-12980
Certificate Number

CAL INC. PO Box 6327 Vacaville, CA 95696 707-446-7996

CAL ENVIRONMENTAL SERVICES INC

This is to certify that

Bruce L. Merrill

has successfully completed 8 hours of formal training entitled

Hazwoper 8 hr. Refresher

5/7/96 to 5/7/96	5/7/96	5/7/97
Course Date(s)	Exam Date	Expiration Date

Authorized CAL INC Signature

AC-12953
Certificate Number

CAL INC. PO Box 6327 Vacaville, CA 95696 707-446-7996

*****END*****

Certificate of Award

THIS CERTIFIES THAT

26761

Winifred Au

successfully completed the **initial 40 Hour** requirements
listed under **OSHA Regulation 29 CFR 1910.120** and **Title 8 GISO 5192**

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

this Fourth Day of March 1994

Geo Line

Geo Line
425 Stockton Avenue
San Jose, CA 95126

Dani Renan

Dani Renan, REA
Lead Instructor

CERTIFICATE

Winifre Au
Employee No.: 12330

Has completed the requirements of 8 hours of Annual Refresher Training in conformance with 29 CFR 1910.120.

January 23, 1996

Signed: David A Waite

David A. Waite
CH2M HILL
Director, Comprehensive Health and Safety Program

(This certificate is valid only while the individual named above is employed by CH2M HILL.)

SFO

Certificate of Award

THIS CERTIFIES THAT

30041

Claudia Cornejo

successfully completed the **initial 40 Hour** requirements
listed under **OSHA Regulation 29 CFR 1910.120** and **Title 8 GISO 5192**

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

this Twenty-third day of September, 1994

Geo Line

Geo Line
425 Stockton Avenue
San Jose, CA 95126

Dani Renan, REA
Lead Instructor

CERTIFICATE

Claudia Cornejo
Employee No.: 13556

Has completed the requirements of 8 hours of Annual Refresher Training in conformance with 29 CFR 1910.120.

January 24, 1996

Signed: David A Waite

David A. Waite
CH2M HILL
Director, Comprehensive Health and Safety Program

(This certificate is valid only while the individual named above is employed by CH2M HILL.)

SFO

Certificate of Award

33411

David Kinney

successfully completed the **initial 40 Hour** requirements
listed under **OSHA Regulation 29 CFR 1910.120** and **Title 8 GISO 5192**

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

this Thirteenth day of January, 1995

Geo Line
425 Stockton Avenue
San Jose, CA 95126

Mark Hickey
Course Instructor

Geo Line

CERTIFICATE

Dave Kinney
Employee No.: 13559

Has completed the requirements of 8 hours of Annual Refresher Training in conformance with 29 CFR 1910.120.

January 24, 1996

Signed: David A Waite

David A. Waite
CH2M HILL
Director, Comprehensive Health and Safety Program

(This certificate is valid only while the individual named above is employed by CH2M HILL.)

SFO

Certificate of Award

THIS CERTIFIES THAT

2029I

Marty P. Medina

successfully completed the **initial 40 Hour** requirements
listed under **OSHA Regulation 29 CFR 1910.120**

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

this Twenty-fourth day of July 1992

Geo Line

Provided by
Geo Line
425 Stockton Avenue
San Jose, CA 95126

Dani Renan
Lead Instructor

CERTIFICATE

Marty Medina
Employee No.: 11926

Has completed the requirements of 8 hours of Annual Refresher Training in conformance with 29 CFR 1910.120.

January 24, 1996

Signed: David A Waite

David A. Waite
CH2M HILL
Director, Comprehensive Health and Safety Program

(This certificate is valid only while the individual named above is employed by CH2M HILL.)

CH2MHILL Health & Safety

SFO